American Machinist

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Motor Aisle—Westinghouse's new set-up for a.c. motor manufacture points to the increased industrial use of this product.

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THE PUBLISHERS

EDITORIAL

Free Gulliver From His Bonds

TODAY IN THE United States industry is in much the same predicament that Gulliver found himself when he awoke in the land of Lilliput. In that tale Gulliver was aboard a ship which was wrecked while bound for the East Indies. Putting to sea in a small boat with other members of the crew, he saved his life by swimming ashore after the tiny craft was overturned in a sudden flurry of waves and wind.

Exhausted he lay down to sleep. When he awoke he was astonished to find that he could not stir. Lying on his back he found his arms and legs were strongly fastened on each side to the ground. His hair, which was long and thick, was tied down in the same manner. Slender strong cords extended across him from his armpits to his thighs. He was a captive of the Lilliputians.

Struggling to get loose, Gulliver broke the strings and wrenched out the pegs that fastened his left arm to the ground. The Lilliputians discharged hundreds of arrows at him, but they only pricked him like so many needles. Then these little people attempted with spears to stick him in the sides, but they could not pierce his jerkin.

They did succeed, however, in keeping him a prisoner, but soon granted him considerable liberty, finally freeing him from his chafing bonds. A short time thereafter Lilliput was threatened with invasion by the empire of Blefuscu, its traditional enemy. On that occasion it was Gulliver who saved Lilliput when he walked out into the sea and cut the anchors of Blefuscu's fleet, towing all the vessels to the shore of Lilliput and ending the war in a hurry.

Industry at present is in the same unhappy state in which Gulliver found himself when he awoke in Lilliput. It is tied to the ground and is unable to move. Among the thongs holding it down are the capital gains tax, the undistributed profits tax, excessive advances in building labor costs, monetary policies which halt rather than aid recovery, the punitive attitude of the administration toward public utilities, an unbalanced federal budget, and uncertainty regarding what the government will do next.

IF WASHINGTON genuinely wishes the present dip in business activities to be of the shortest possible duration, it will move quickly to cut the cords now binding industry. Then industry will be able to help the country to combat those forces which have brought on a serious business recession. Industry, freed from its fetters, may well prove to be another Gulliver saving the country.

Which Metal-Working Union?

C.I.O. can find a score of places for a metal worker, A.F.L. offers a dozen berths not counting the International Association of Machinists, and the independents are also willing

FRANK RISING
Labor Editor, Business Week *and* American Machinist

"BONE OF CONTENTION" is not a bad description for the role assigned to the metal and machinery worker, in the current dog-fight between labor unions for the unorganized employees in industry. There is good reason for the fact that most of the jurisdictional disputes concern metal-working or machinist groups—they are found in every industry. And for years the scrap between industrial unionism and craft organization has had these workers right in the middle.

Nowadays, the worker in metal has plenty of chances to join a union. Some two score organized national and international groups will welcome him. Of course a polisher, a boilermaker, a machinist, a molder, or a pattern maker are all given separate slots by the American Federation of Labor, but since the Committee for Industrial Organization got hot the A. F. L. unions have quit being finicky about strict classification. So—there's the first tug-of-war, with the metal worker as the rope, between craft groups.

However, such jurisdictional disputes as may arise between the A. F. L. organizers, pesky though they may be, are minor matters compared with the big question which C. I. O. has tossed onto the table. It is this: "Is there really any sense in pinching the metal trades into small groups, when organization of one big union for each shop is possible?"

This question first was asked in NRA days, when a trend away from established craft lines was noticed in several industries. Joint action by groups of workers in shipbuilding, heavy electrical equipment, and airplane manufacture began on industrial union lines. Bigger than any of these was the movement in the automobile plants, which had pretty well resisted the efforts of the craft unions to organize, but which during 1933 and 1934 saw the beginnings of a strong union drive. In 1935 the resultant industrial union was affiliated with A. F. L.; within a year it moved over to C. I. O.; today it is the United Automobile Workers union, big, tough, and cock-of-the-walk in its field. It doesn't bar machinists—in fact, some of the bitterest arguments before the National Labor Relations Board have been between U. A. W. and one or another of the A. F. L. metal trades unions, with the International Association of Machinists usually carrying the ball for the craft team.

All Are Welcome

Other C. I. O. unions (there are 32 of them) are of the same mind as U. A. W. They seek enrollment of an entire plant, and at least 24 of them feel that it doesn't make much difference whether the individual is an electrician, machinist, carpenter, or what-not—as long as he works for Blank Company. Very significant was the recent action of the C. I. O.'s Electrical and Radio Workers union; it met in convention at Philadelphia and changed its name to Electrical, Radio, and Machine Workers.

The reason for this step was this: In the early flush of enthusiasm, some of the C. I. O. unions (U. A. W. is a good example) took in workers from any and all kinds of businesses in their immediate localities. Thus sausage makers found themselves organized as automobile workers—a much-quoted example which is used by the A. F. L. spokesmen frequently. As the union drive settled down a bit, however, the misfits were culled out and passed along to other internationals or given separate affiliation as local unions. The big C. I. O. unions came to an agreement between themselves: In the case of disputed affiliation, the main manufacturing shops could be classified as automobile makers, radio and electrical plants, steel producers, and so on. If the plant in question was a feeder, or parts maker, the destination of the bulk of its product would determine classification of its union.

Thus a plant in Detroit might be making parts for both automobile plants and radio manufacturers. But if it supplied more goods to the radio and electrical makers, it would be included as a part of E. R. and M. W. rather than of U. A. W., despite the fact that it might be nextdoor to a big U. A. W. plant.

After this arrangement had been made, the Electrical and Radio union still didn't have a name which appealed to the machinists taken over from other C. I. O. groups, and therefore the change in terminology was made.

At present, in addition to all of the foregoing places for a metal worker to sign a union card, there are a number of independent groups which are making some gains. One is the often-interred I. W. W., which has turned back both C. I. O. and A. F. L. in two or three contests for representation rights in Cleveland; another is the M. E. S. A. (Mechanics Educational Society of America) whose tool and die makers have met the U. A. W. head-on in the Toledo area several times but not with notable success.

In addition to all this, the popular machinist has another good place to join, if he wishes. More and more frequently the initials "E.R.P." are coming into the contests for bargaining rights. These initials stand for Employees Representation Plan, denoting dozens of independent organizations in shops large and small that are making themselves heard. Whether they will stay independent, or later will merge with one or another of the internationals, remains to be seen.

Can the "non-joiner" hold out against all these salesmen? He can, and in a few places is doing just that. True, in a great majority of elections or contests before the regional boards, the well-organized and ably-directed internationals have been out-voting the boys who don't want any union at all. But a significant change has been made in the orders issued daily by the NLRB—they now set elections to offer the employee a chance to choose such-and-such union, or such-and-such union, *or neither*. This space on the ballot for non-unionists is becoming a matter of course, whereas a few months ago it was almost unknown.

Summation of gains made by unions in metal-working trades is difficult if absolute accuracy is desired, yet a fair appraisal would be that both C. I. O. and A. F. L. unions have picked up a lot of members, some of those in C. I. O. being former A. F. L. dues-payers. This latter trend, incidentally, is what makes the metal trades department of the A. F. L. the leader in anti-C. I. O. activity. It is in this field that the C. I. O. has hit A. F. L. hardest—in the other big industrial union booms the fields were largely unorganized.

Most of the independent organizations, small and loosely-directed, take a beating in plant elections if the opposing union has a head-start in organizing or is old and experienced. Where they start on an equal footing, both young and relatively inexperienced, the vote usually is a nip-and-tuck affair.

Tide Still Strong

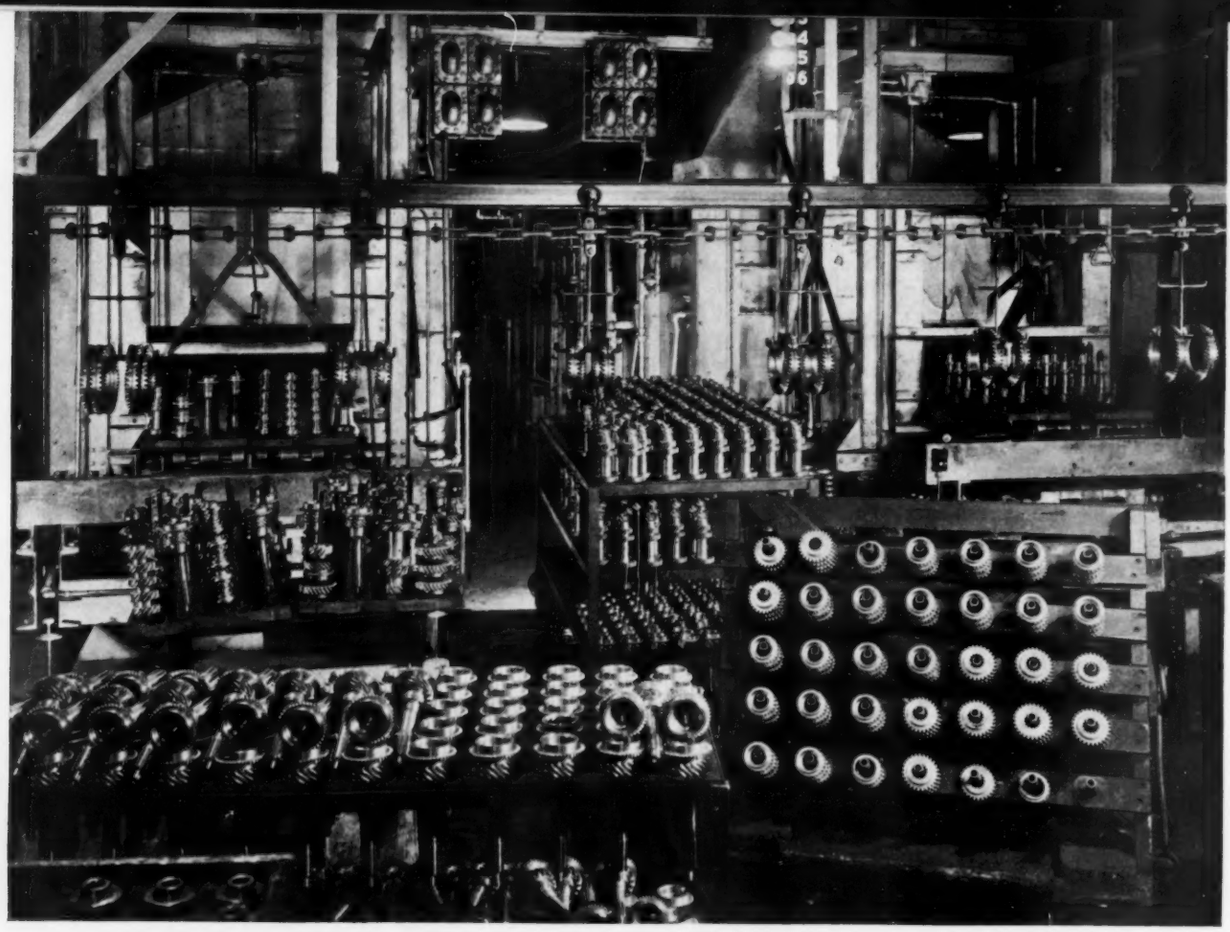
After checking back over the record of recent plant elections, there is little doubt that the tide still runs strongly toward union membership of some kind, and against the "no union of any kind" sentiment. For example, the NLRB election reports and certifications on 55 contests of all kinds decided during the first three weeks of October show the following result: C. I. O. unions won 24, A. F. L. unions won 14, independent unions won 9, and in six cases the employees voted to remain non-union, at least for the time being. Two of the elections were ties, with no decision and with organizing consequently still going on apace.

This includes all kinds of elections — C. I. O. against A. F. L., C. I. O. or A. F. L. against independents, and sometimes all three of them tossed into one scrap. Quite often there is only one group on the ballot, with a straight "yes or no" choice open to the worker. Sometimes the working force is small—as in the case of the Ulmann Company in San Francisco; results were five votes for C.I.O., five votes against C. I. O. Only 10 votes in all, and a perfect standoff.

Occasionally the results are so conclusive that future peace seems probable, with the minority accepting the decision as fair and complete. The Globe Machine & Stamping elections on Oct. 25, for example, found two big A. F. L. unions, an independent union, and a big C. I. O. union contesting for the right to speak for employees. The C. I. O. union (United Automobile Workers) beat the A. F. L. polishers group 16 to 12, beat the A. F. L. machinists group in a punch press election 67 to 38, and completed a clean sweep by defeating the local union among other production employees 282 to 16.

In another test, however, in another place, results may be conclusive but still leave a chance for future disputes. In the International Harvester election Oct. 7 at Springfield, Ohio, the powerful U. A. W. took a thumping—3753 to 1418 with an independent union on top. Question is: Will the 1418 losers take the decision in good grace, or will the company face another dispute and another election when the present agreement runs out?

Currently, the fire is not nearly so hot in union drives as it was last spring. Many organizers have been called in from the road and sent back to their former jobs, budgets have been trimmed, and the unions are trying to consolidate and coordinate their activities. One big problem is collection of dues, which has lagged badly among most of the "new unionists." Another is the problem of holding enthusiasm high when business volume is receding and wage hikes are out of the picture. And with all trends put together, the machine and metal worker probably will be a good deal less bothered by union organizers for some months to come, with a fair hope of getting off of at least one "spot" if the C. I. O. and A. F. L. compose their differences.



Two Holcroft furnace units carburize a wide variety of gears and similar parts in the Detroit plant of the Packard Motor Car Company. One of these units is equipped with a tempering furnace

Clean Carburizing in the Packard Plant

Work delivered from furnaces is so clean that parts have only to be washed before use

TWO HEAT-TREATING units for automatically case-hardening gears by gas carburizing have been put into operation in the Detroit plant of the Packard Motor Car Company. Because of the cleanliness of their operation, these furnaces are located in the machine shop and parts are delivered to them from the gear-cutting department on an overhead monorail conveyor.

One of these units consists of a carburizing furnace, an oil quenching tank, a washing machine and a tempering furnace. It is designed to carburize transmission gears, differential side gears and pinions, and certain other parts at a rate of 720 sets in a 24-hr. day. The second unit is similar to the first, except that it does not have a tempering furnace. This second unit is used mainly to carburize rear-axle ring gears and pinions which are not tempered. The carburizing furnaces are identical and, if occasion demands, either can be used at different times on transmission or rear axle parts.

Transmission gears are carburized to a total case depth of 0.035—0.040 in. on the pitch line and to a maximum hyper-case of 0.004 in. Ring gears and pinions are carburized to an effective case depth of 0.045—0.050 in. on the pitch line. Some of the carburized parts are made of S.A.E. 4620 nickel-molybdenum steel, while other parts are of S.A.E. 3115 chrome-nickel steel.

Gears are placed by hand on fixtures fastened to trays at the loading end of the furnaces. The trays then are pushed automatically through the furnace on stationary skid rails. At the discharge end of the furnace these trays are carried by a separate mechanism on to a "lowerator" which lowers them into an oil quench tank. While in the tank, the trays are transferred to an elevator which carries them to the

working height of the washing machine and of the tempering furnace, through which they are carried on skid rails.

The propelling mechanism, which carries each row of trays through the washing machine and the tempering furnace, consists of a moving rail having tilting dogs which push each tray individually. This provides space between the trays to permit the operation of doors on both the washing machine and the quench tank. There is one door between the wash and rinse position, and a door at each end of the tempering furnace.

The carburizing furnaces are equipped with cast nickel-chromium alloy muffles, which are of corrugated construction to provide the structural strength necessary to maintain shape under load at operating temperatures. These muffles are supported on heavy cast saddles which, in turn, are carried on rollers to take care of expansion and contraction of the muffle.

Natural Gas Used

Furnaces are fired with natural gas and are automatically controlled in five zones. There are two heating zones, two holding zones and a final zone for controlling the temperature from which the parts are quenched. This final zone may be operated at lower than carburizing temperature if desired. The two heating zones take care of the two different time cycles required by transmission and rear axle parts. On transmission gears requiring only five hours in the furnace, both of these zones operate as heating zones, while on ring gears and pinions requiring a longer time cycle, the heating is accomplished in the first zone and the second zone becomes the first holding or carburizing zone.

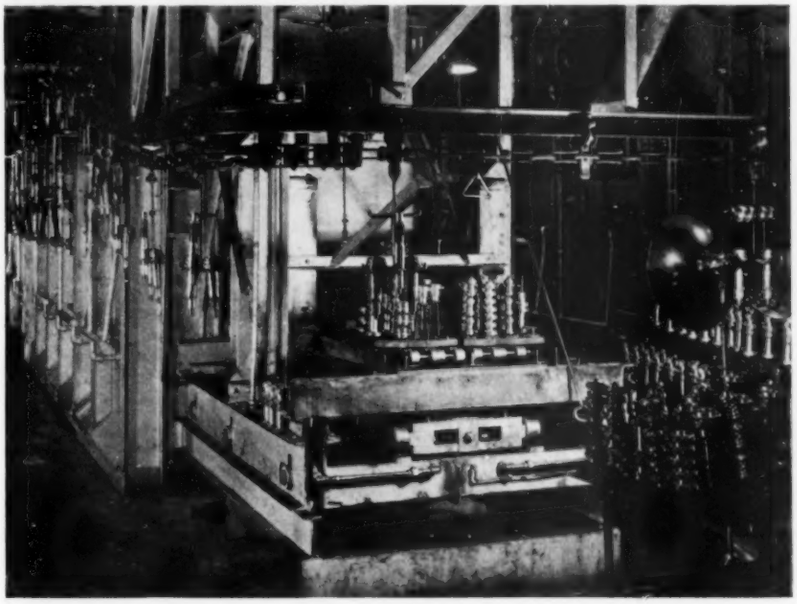
Heating and final zones are both over and under fired, while the holding zones are underfired only, all with low pressure. McKee burners are manifolded with the necessary proportional mixers and automatic control valves to provide proper control of the furnace temperatures. Five Leeds & Northrup recording controllers actuate the automatic control valves and mixers.

Carburizing gas consists of natural gas diluted with a neutral gas prepared in a separate gas generator. Gas is introduced into the furnace muffle at a number of points throughout its length. Type of case produced is controlled by the amount of raw natural gas added to the neutral gas, which is normally fed into the furnace in constant volume. With this control, operation is simple and carbon content of case can be varied as desired.

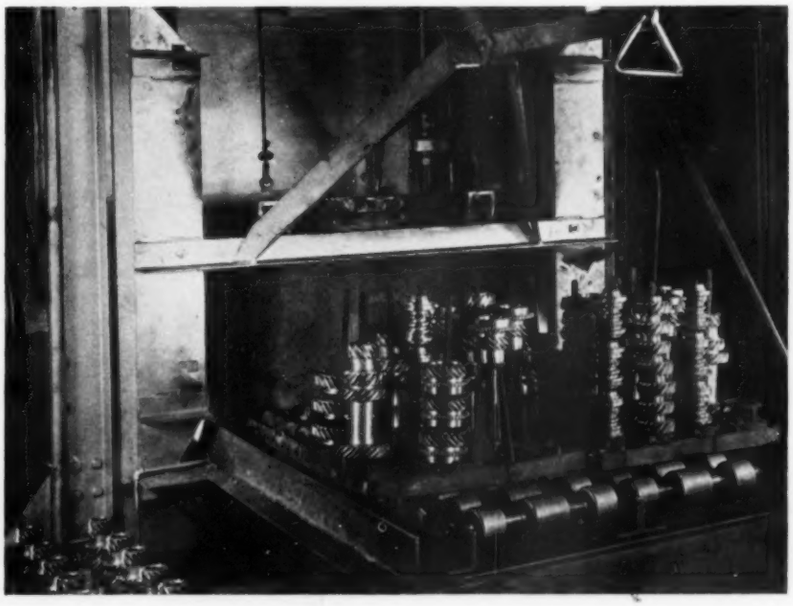
Each carburizing furnace including quench tank, is 51 ft. long, 7½ ft. wide and 9½ ft. high. Floors of the carburizing furnaces consist of fire brick laid on 10 in. of insulating brick. Sidewalls and roof are 9 in. of insulating brick, backed by 5 in. of standard insulating brick. The tempering furnace is 12 ft. long, 3 ft. wide and 20 in. high, and is of the recirculating type. Wash and rinse tanks are 8 ft. long, 4 ft. wide and 6 ft. high.

The kicker mechanism, which normally carries the gears and parts onto the "lowerator," automatically carries trays with ring gears past the quench chute to a station just inside the discharge end of the furnace. From here the ring gears are slid out of the furnace one at a time by hand and placed in Gleason presses for quenching.

Cleanliness of the heat-treating operation permits installation of these furnaces in the manufacturing line. Parts are delivered from the gear-cutting department by means of overhead conveyors



Parts to be carburized are placed by hand on trays at the loading end of the furnace. Parts are carburized at 1,680 F. and transmission gears are tempered at 435 F.



Gas Cutting In the Machine Shop

Facts and figures which will answer some of the questions on the possibilities and limitations of gas as a shaping material

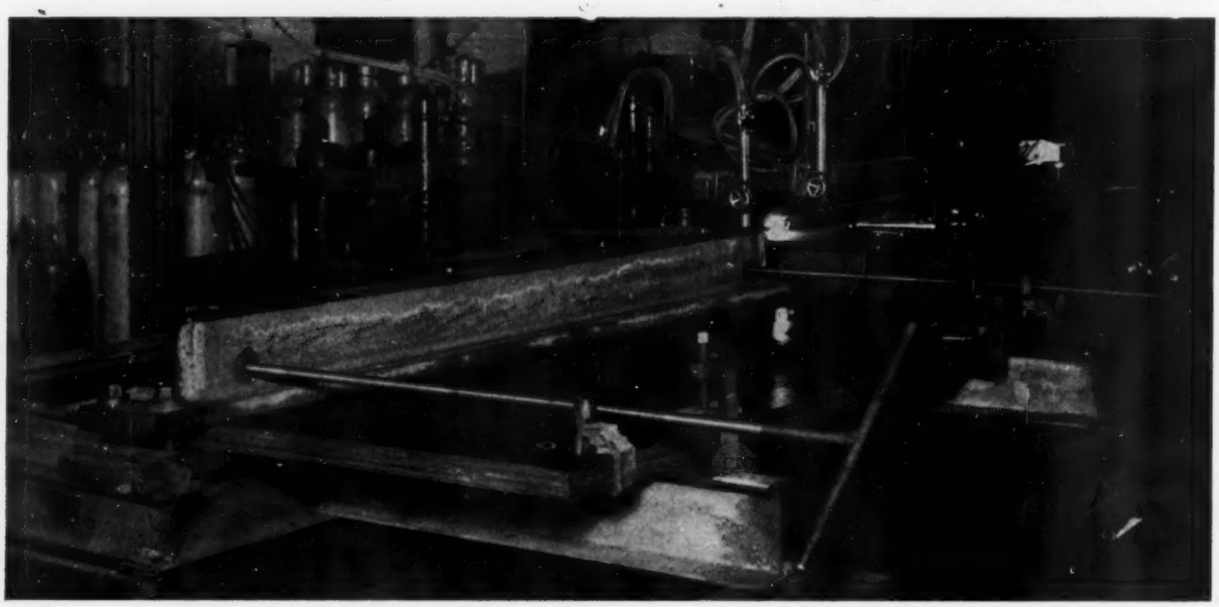
R. F. HELMKAMP
Machine Cutting Specialist, Air Reduction Sales Company

AS A PROCESS that must be chosen or rejected for the machine shop, on its merits and in direct comparison with other methods of cutting, gas cutting deserves careful analysis to determine what manner of work it will do and what economies can be obtained.

Generally speaking it is fair to say that oxyacetylene cutting can be employed on a basis comparable to any rough machine tool cutting. This is, paradoxically, both an overstatement and an understatement. It is an overstatement in that not all cutting operations, such as those done on a shaper, can always be done with sufficient certainty and accuracy with the torch. It is an understatement in that the latest developments in torches, tips and gas cutting machines have made possible a degree of perfection in the finished surface that is almost unbelievable when seen for the first time.

As in the case of machine tools, there has been designed a wide variety of oxyacetylene cutting machines, differing in size, range and method of guiding the torch, and adapted to specific classes of work. These include the cutting of straight lines and circles, repetitive cutting of identical parts having either regular or irregular pattern, and the simultaneous operations of from one to four torches on one machine. As such machines are motor driven, it is of the greatest importance that their electrical equipment be especially designed for the service required. They have variable-speed motors with provision for remote control and for quick speed adjustment when varying cutting conditions are encountered. Of interest is the choice provided in methods of guiding the torch. The tracing wheel may be guided by hand, or by mechanical tracer guided by a wood, metal, or fiber templet, or by a magnetized roller following a steel templet. Further variety is pro-

Stack of 3/4-in. plates is held by a clamping arrangement which includes two 2-in. plates top and bottom with 8-in. I-beam for stiffening. Cutter travel is controlled by the cam with magnetic tracer on the right



vided by the use of a radius rod for circle cutting and by the use of a grooved track lying on the tracing table for straight-line cutting.

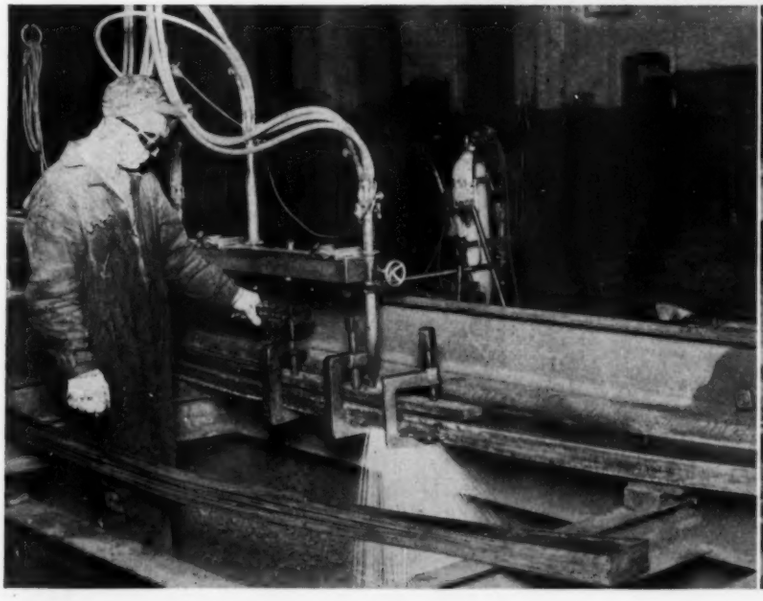
It is not sufficient to observe that steel of almost any thickness encountered in the shop can be cut with ease and speed, and according to any pattern desired. These facts can be demonstrated and the result is indeed highly spectacular. However, the prospective user will certainly want to ask several important questions, such as, what metals can be cut, what effect has gas cutting on the metal, what are the limitations as to thickness, what degree of accuracy can be obtained, what are the cutting speeds, can production costs be predetermined, how do they compare with present practice, what will be the quality of the work, and are specially trained operators required?

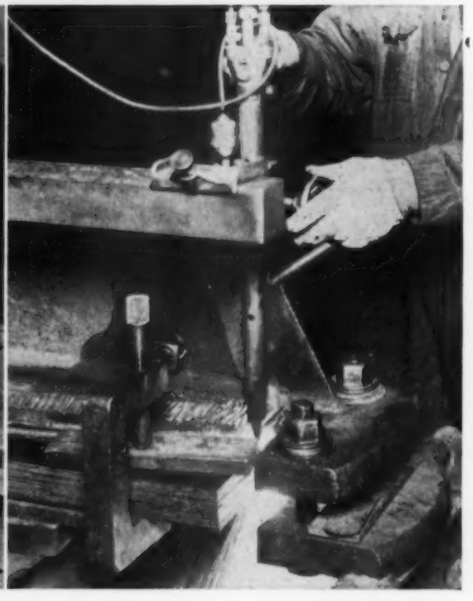
Practically all classes of wrought iron, rolled steel and steel castings may be flame cut. Steels under 0.30 per cent carbon can be cut cold, or without heat-treatment before or after cutting. Machine gas cutting of these steels is just as well

Oxygen lance is being used to pierce locomotive main rod forging as first step in cutting out bearing end. Rod has been preheated to about 1000 F.

Gas machine following cam on tracing table begins cutting from pierced hole. After completion of cut, next step will be to trim the outside of the rod end using the outside of the cam for the magnetic tracer

Cut has progressed about halfway with auxiliary clamps placed where needed. Details of clamp can be seen as cutter reaches end of stack on right





standardized and just as much a matter of course as shaping by any of the older accepted machining methods.

Steels in the higher alloy group can also be cut without difficulty. These steels, however, should be preheated before cutting and annealed afterward. When this procedure is followed, cutting is no more of a problem than with the lower carbon steels.

The effect of flame cutting on the metal is a logical question. To those interested in the metallurgy of it, the facts are available. From the practical standpoint of the user, machine gas cutting has the advantage of numerous kinds of studies and analyses. We may summarize the results briefly, and they have been verified over a long period of time by the experience of those employing the process in accordance with clearly defined correct practice.

Heat-Treatment Not Needed

Flame cutting has no appreciable effect on the physical and chemical characteristics of the plain low carbon steels, which, for example, constitute the bulk of steels used. That is why these steels are cut cold and need no heat-treatment except in the case of large forgings which should be annealed and cut hot because of the inherent strains.

Steels over 0.30 per cent carbon tend to have some migration of carbon to the flame-cut surface. When correct practice is followed and these steels are preheated before cutting and annealed afterward, they are just as easy to cut as the lower carbon steels and can be machined afterward without difficulty. The annealing returns the steel to practically its original state. Where machining or grinding operations are performed after cutting the comparatively small affected area is completely removed, and there need be no concern about the effect of flame cutting on the metal.

Any plate and forging thicknesses commonly handled in the machine shop offer no difficulties whatever to the machine gas-cutting process. The oxyacetylene torch has severed sections up to 30 in. thick and over.

Flame cutting can be relied on for a surprising degree of accuracy. The squareness and clean finish of such cuts, together with the sharp top and bottom edges, compare favorably with rough machining. The degree of accuracy depends largely on the grade and thickness of the material, and the intricacy of the shape. Where no subsequent machine finish is required, ordinary steel plate generally may be cut right to the finish line. On the higher carbon steels and parts which are to be machine finished, only a sufficient tolerance need be left to allow for easy and economical machining.

Since tolerance varies, with the grade of work to be done, it may be readily compensated for by making due allowance on the drawing, templet or cam used in cutting the shapes. The kerf, or width of the cut, is taken care of the same as tolerance. The allowance is usually no more than would be made with other methods.

The question of getting good operators presents no unusual difficulties. Any shop man of average intelligence and ability can learn to operate a flame-cutting machine.

Cutting speeds and gas consumption costs are items that vary, depending on the kind of steel, thickness, intricacy of the contour and the quality of finish desired. Set-up and gas consumption tables for steel up to 12 in. thick or more are available from equipment makers. Reference to these tables provides reliable estimates on gas consumption and cost as well as the actual cutting time. Tip sizes and gas pressures, which represent good cutting practice, are also shown. The accompanying chart gives these relationships for one tip orifice.

Actual gas comsumption costs can be estimated. Other cost factors are handling, set-up time and overhead. Hourly overhead is known. Handling and set-up time can be readily determined from a study of the actual job. The sum of gas consumption costs, handling and set-up costs and the overhead is the total cost of machine gas cutting.

Pick out a characteristic job, the production costs of which are known, and estimate the cost of machine gas cutting the same job, using the data shown in the available cutting tables. Compare them and determine if there is any saving, particularly if the flexibility of the process, the ease and speed of accomplishment, the dependability, quality and accuracy that machine gas cutting offers are considered.

The quality of steel or type of work will justify certain variations from the graph. Increase the preheat or decrease the speed if the cut is lost. Decrease the preheat if top edges melt down. Higher speeds and larger tips or slightly higher pressures may be used for rough cutting. For intricate shapes or sharp turns it may be necessary to use speeds lower than specified to preserve the quality of cut. Reduce speed if drag is too long for satisfactory work. Increase speed or reduce pressure if drag is too short to be economical. Undercut with hand cutting torch to start heavy cuts.

For bevel cuts arrange the tip so that flames straddle the cut, then increase preheat and decrease speed. In other cuts arrange tip so that one of the preheating flames is leading. Position the tip so that inner flame cones barely clear the work.

APPROXIMATE GUIDE FOR MACHINE CUTTING

Thickness - Inches	1/4	3/8	1/2	3/4	1	1 1/2	2	3	4	5	6	8	10	12
Airco - DB Tip Style 124	0	1	1	2	2	3	4	5	5	6	6	7	7	8
Pressure - Lb./sq.in.														
Oxygen	30	30	40	40	50	50	50	50	60	50	55	60	70	70
Acetylene	3	3	3	3	3	3	3	4	4	5	5	6	6	6
Speed - In. per min.	20	19	17	15	14	12	10	8	7	6	5	4	3 1/2	3
Consumption Cu.ft. per hour														
Oxygen	50	75	90	120	140	200	255	335	385	460	495	650	735	875
Acetylene	9	12	12	14	14	16	17	22	22	28	28	35	35	40
Approximate width of Kerf - In.	5/64	3/32	3/32	7/64	7/64	1/8	9/64	11/64	11/64	3/16	3/16	7/32	7/32	1/4
Cleaning Drills														
Cutting	63	57	57	55	55	53	50	46	46	42	42	35	35	31
Preheat	71	69	69	67	67	66	64	62	62	60	60	58	58	57

A Compact Job Shop

Despite crowded quarters, a Florida job shop operates satisfactorily through careful arrangement of equipment

CHARLES F. HENRY

ONE OF THE most compact shops that I have ever seen is that of McKinney & Moore, Orlando, Fla. There are few shops like this one where twelve machines and a hydraulic press are put in a space of 19x32 ft. In addition, there are an electric welding outfit and oxy-acetylene equipment. None of the equipment is new, as indicated by the Pease planer and the Steptoe shaper. It is the practice of this shop, however, to overhaul every machine thoroughly once a year and to give it a coat of paint.

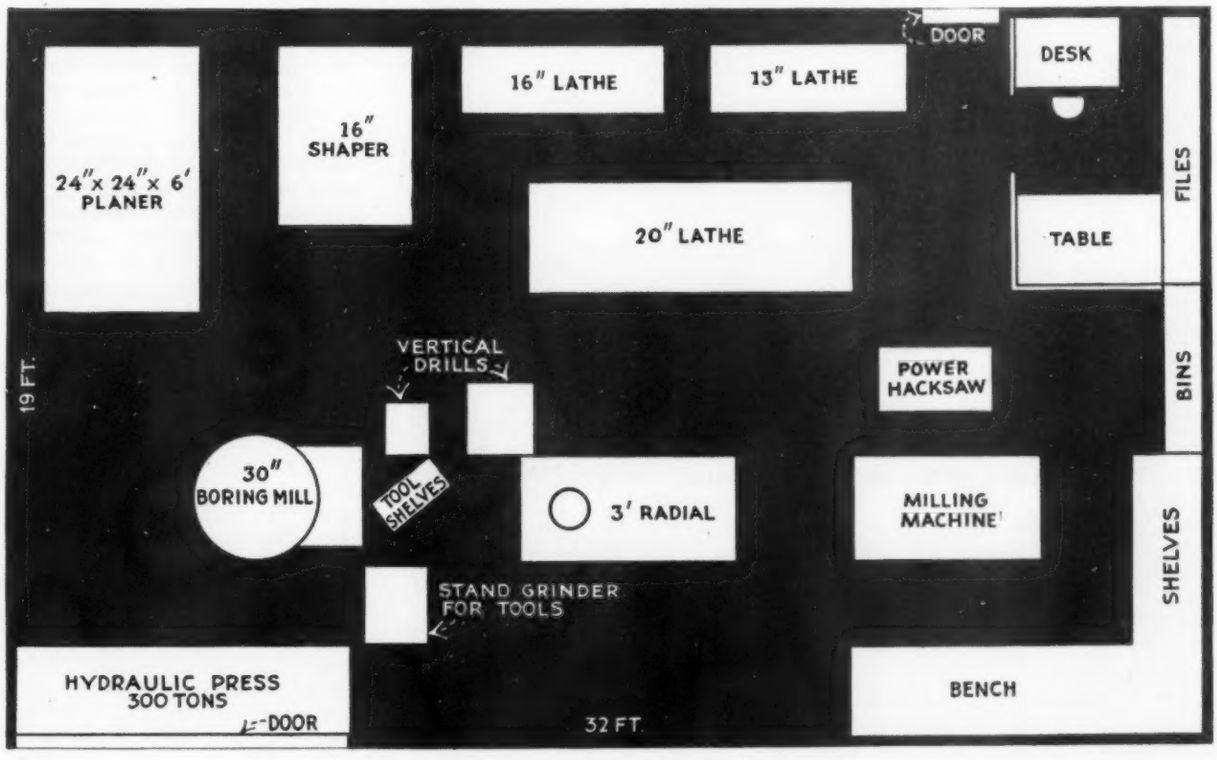
The main door is the one shown near the desk. Diagonally opposite is a wide sliding door which opens to the 300-ton hydraulic press. All the work on this press is done with the door open, both for access to the press and to give room to work. The shop can also be entered by passing the corner of the press. This press, incidentally, is the only one for miles around, which insures a fairly steady run of work that requires press fits. Such jobs include tractors, packing-house machinery, road machinery and similar work—frequently an emergency job.

The "office" is small, in the corner by the small door, but answers every purpose. It has ample room for files against the end wall. Along the same wall is a stack of bins for holding various materials such as screws, bolts and the like, while the open shelves beyond hold castings for bushings and other parts that go to make up the work of a job shop.

This shop was originally laid out for lineshaft drive arranged to avoid crossed belts. Since then each machine has been motorized, using ingenious supports of various types to hold the motor either above or below the head of the machine.

The building is made of corrugated steel for both sides and roof. An opening is left between the sides and roof for ventilation, this space being closed by a storm curtain when made necessary by rain.

Little room is needed for dismantling and assembly because the climate permits most of this work to be done outdoors



Centralized Department For A.C. Motors

Motors manufactured to customer's specifications are given special service without disturbing production schedules for standard units in the new Westinghouse department at East Pittsburgh

BEN C. BROSHEER
Assistant Editor, American Machinist

FACED WITH INCREASING production requirements and desiring to improve service to customers requiring motors designed for particular applications, Westinghouse Electric & Mfg. Company has planned and installed a modern department for manufacturing a.c. motors ranging from 1 to 50-hp. capacity in No. 204 to No. 445 NEMA frame sizes. Essentially, the new layout consists of two manufacturing lines; one for standard-stock motors and the other for special-specification motors. Each of these lines has unit manufacturing centers that feed parts by conveyor to "matching-up" or sub-assembly and assembly stations.

Manufacturing turnover has been calculated on a two months' basis and necessary normal production capacity is provided to make parts for motors in 1 to 5-hp., 5 to 25-hp. and 25 to 50-hp. ratings. Once the machine requirements for each group of operations had been determined, "economic-lot" quantities were calculated so that set-up time for a lot of standard parts would not exceed ten per cent of the total machining cost. Material and overhead cost factors were considered indirectly in the calculations.

More than 300 machine tools and many special tools and fixtures will be used to produce the normal load of motors each month. Peak capacity will represent an increase of about 40 per cent over previous possible capacity.

Raw materials and parts delivered from other departments, or purchased from suppliers, are delivered by broad-gage railroad cars, narrow-gage industrial railroad cars and industrial-type electric trucks to points near the machining groups. Wherever possible, material handling within the department is by conveyor or hoist; no operator is asked to do any heavy lifting. More than two miles of conveyor lines, mostly of the gravity roller type, have been installed to carry parts through the various machining and assembly positions.

Manufacturing space now devoted to this department formerly consisted of two separate buildings and a portion of a third. Common walls have been removed, an area of 43,270 sq. ft. has been obtained by roofing a separating yard formerly used for outdoor casting storage and 5,600 sq. ft. of floor space has been provided by the erection of an extension to the building formed by roofing the yard. The department, one of the largest in this Westinghouse plant, has a total area of 197,000 sq. ft.; main aisle measures 110 by 1,310 ft.

White paint has been applied throughout the interior of the de-

Standard stator lamination punchings are produced in automatic press lines which are equipped with belt conveyors to transfer the sheets from one press to the next. Belt conveyors below the floor level transfer rotor cookies to a second punch press group

partment and the lighting system, supplemented by sunlight admitted by glassed areas in the roofs and side walls, provides an average light intensity of 30 ft.-candles at the work level. The large aisles, where most of the machining, winding and assembly operations for standard motors are performed, are equipped with alternately spaced 400-watt mercury and 1,000-watt mazda units. High-bay mounting adequately mixes the light furnished by this arrangement. The special-motor sections are lighted by combination-mercury-mazda units, each employing one 400-watt mercury and three 150-watt mazda lamps. Both the shaft section and the bracket section are equipped with similar combination units.

Flexibility and reliability are claimed for both the power and lighting circuits. "De-ion" circuit breakers are used throughout the power circuit and "Nofuze" panelboards control the lighting system. Square metal troughs having hinged covers and supported on building columns serve as ducts to carry three 500,000 cm. rubber-insulated cables for the main distribution of a.c. power. A 4/0 white-braid cable is also carried and is used for neutral connections. This a.c. system furnishes 220 volt, 3 phase, 4 wire, 60 cycle power. The 250-volt d.c. feeder buses are laid in similar square ducts and consist of three 4/0 rubber-insulated cables, one being covered with white braid to identify it as the neutral wire.

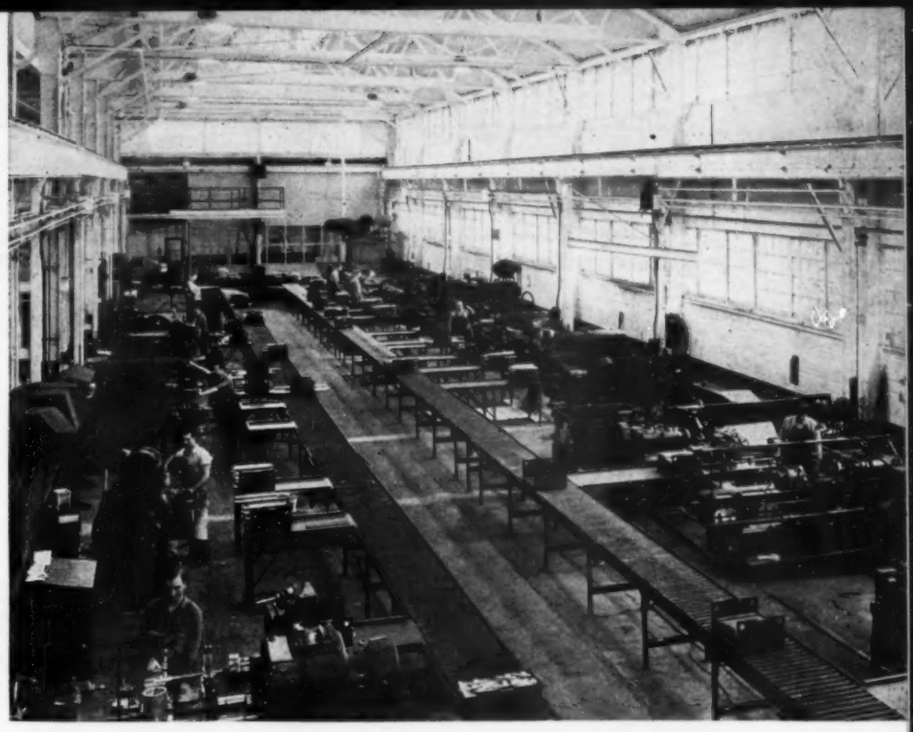
Branch Circuits Sealed

Machine-tool drive and control branch circuits are fed from an under-floor-duct system in which ample provision has been made for future connections. Potheads, through which the feeder-circuit cables emerge at the building columns and machines, are sealed against the entrance of dust, metal chips, water and other liquids.

A large variety of parts is required in the manufacture of a complete line of motors having all of the electrical and mechanical modifications required by the trade. There are literally thousands of specifications for motors in the types to be produced in this new department. The general review of tools, jigs and patterns occasioned by this move has brought to light a number of instances in which designs could be changed to permit a reduction in the varieties of parts required.

A study of stator punching designs, for instance, showed that a new series of deep-slot punchings could supplement the group of standard punchings and eliminate a large number of special punchings. Adoption of this supplementary design, with the development of sufficient activity to justify a number of complete dies, has resulted in reduced costs and a greatly simplified stock of finished punchings.

Analysis of the special rotor punching situation showed much the same conditions. For these, special punchings were necessary, but there was not sufficient activity to make the construction of complete dies economical. However, costs of making special rotor punchings were reduced by grouping operations so as to use common dies for shaft holes, keyways, rivet holes and ventilation openings, even though special dies are needed for the large



Good light conditions and functional arrangement of machines is illustrated in this view of the shaft machining bay. Special shafts are handled on the conveyor line shown at the left, while standard shafts travel from operation to operation down the conveyor line at the right

Machined stator castings and laminated cores are assembled into stator units with hydraulic presses. Special fixtures aid in centering the core in the casting. An assembled unit is shown on a conveyor hoist section being raised for transfer to an elevated gravity roller conveyor line

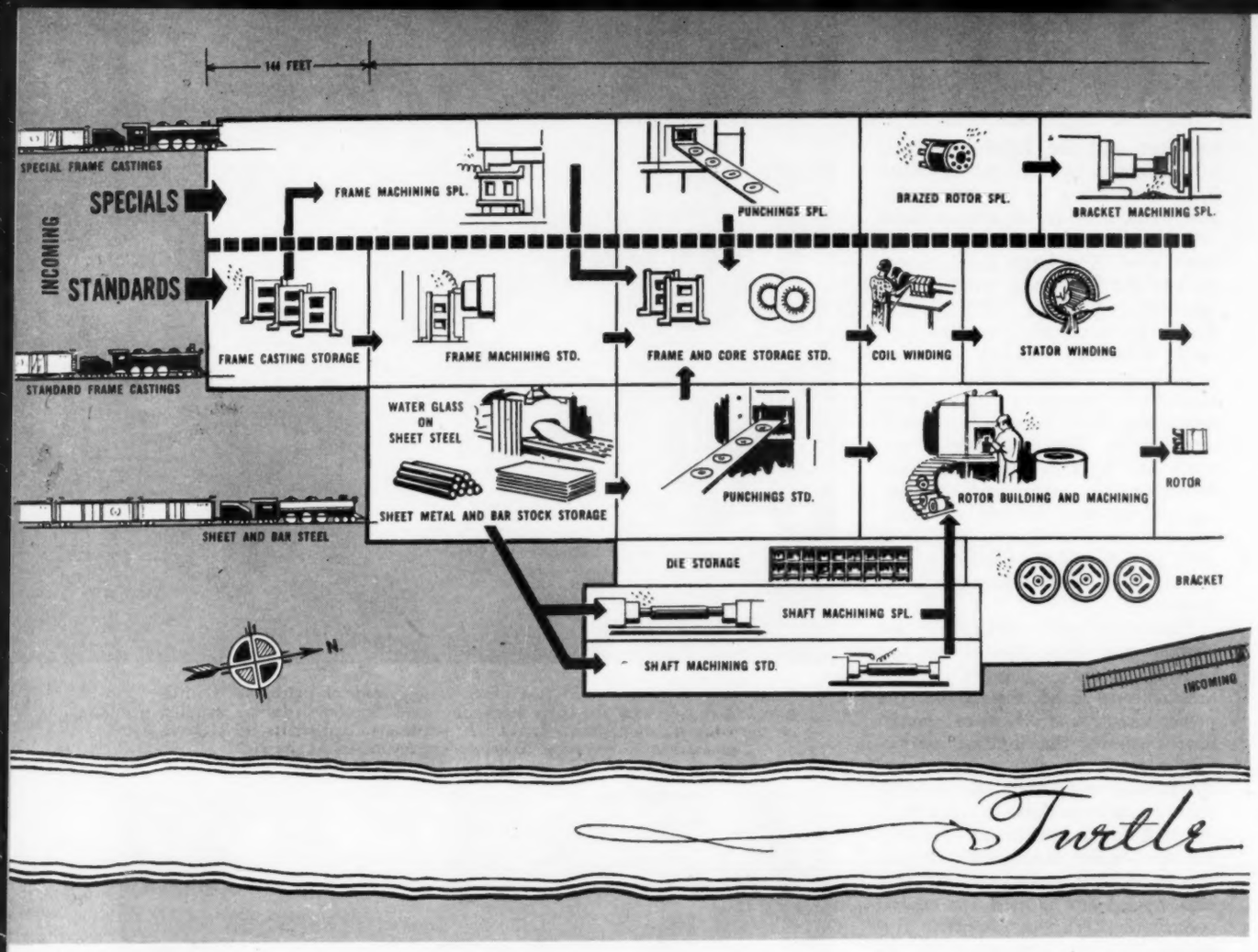


Fig. 1—Standard and special industrial-type a.c. motors, in sizes ranging from 1 to 50 hp., are manufactured in this aisle. Layout for the department consists of two manufacturing lines, each line having unit manufacturing centers that feed parts by conveyors to sub-

variety of slot sizes and shapes.

The new supplementary stator punchings, mentioned above, permitted changes in the design of electrical parts for special motors. This improvement made possible the elimination of a line of special frame castings with resultant savings in pattern maintenance and storage costs, the elimination of special handling charges in the foundry, as well as the elimination of the extra cost of the special machining operations. Another series of frame castings has been changed to reduce foundry costs; at the same time they were arranged to fit into the standard frame-machining set-up, thus reducing machining time by a considerable amount.

Frame Machining

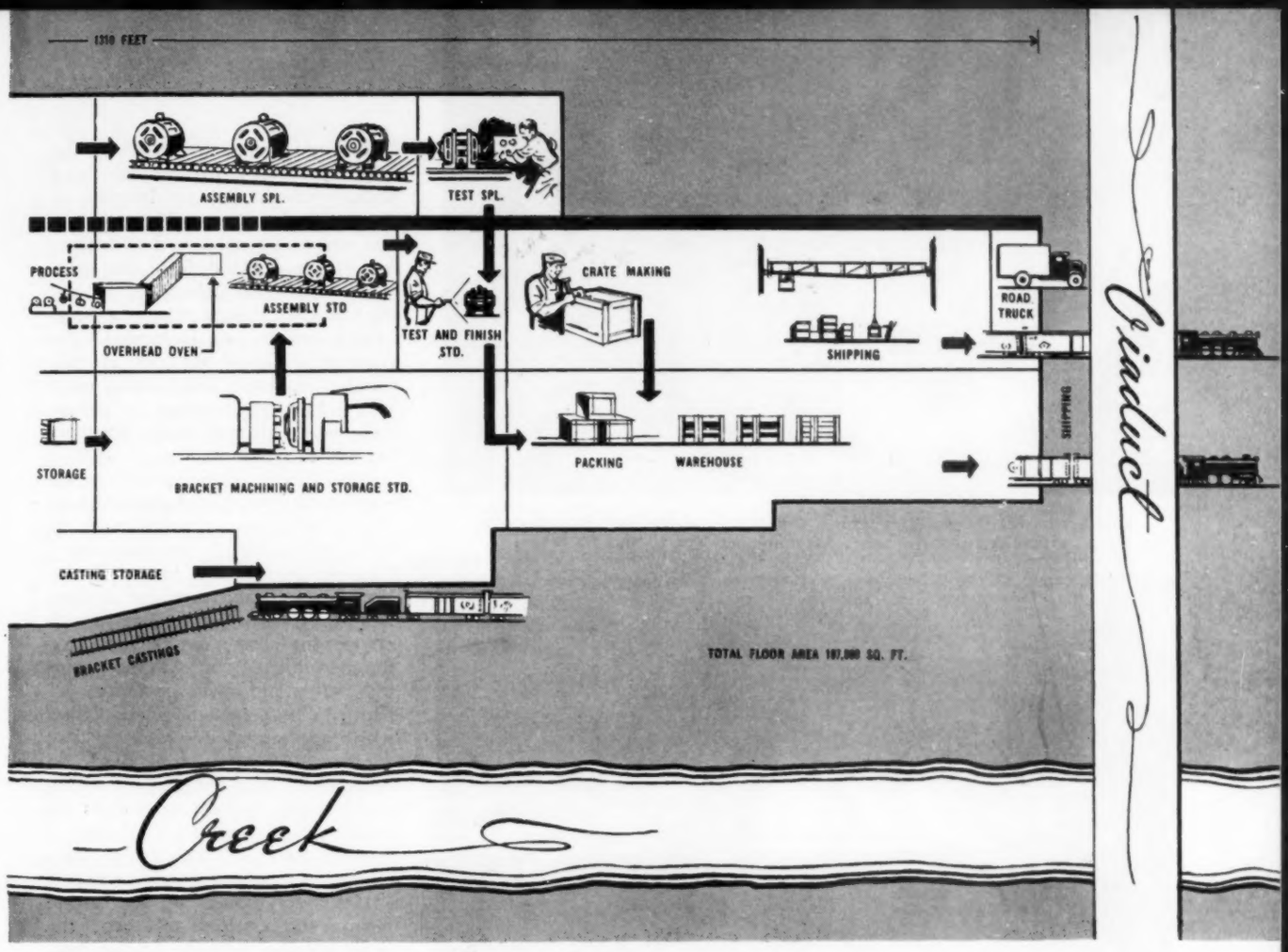
Frame castings are delivered in broad-gage gondola cars, which are brought inside the casting storage area as indicated in Fig. 1. Here a 5-ton capacity, cab-operated crane lifts the 30 to 400-lb. castings from car to floor. Castings are segregated according to size and special frames are located near the aisle leading to the special frame group. Storage capacity is provided for approximately 7,000 rough frames.

Standard frames are bored, counterbored, faced, drilled and tapped complete in one of three frame machining groups, according to size. Each of these groups is serviced by a gravity-type roller-conveyor from the casting-storage area and the frames pass from machine to machine until completed. Machined frames are placed on other conveyor lines to be delivered to sub-assembly presses, where stator cores are inserted, or to a finished-frame storage area to be held until needed.

Mill-size sheets for lamination and end-plate punchings are received from suppliers in broad-gage railroad cars, as are the 16 to 24 ft. mill lengths of 1 to 4-in. diameter steel bars from which motor shafts are machined. A 5-ton capacity, cab-operated crane transfers lamination sheet stock and steel barstock to the storage areas indicated in Fig. 1. Capacity is provided for storing 5,000,000-lb. of 0.017-in. thick lamination sheets and 0.028 to 0.063-in. thick end-plate stock. Approximately 875,000 lb. of steel bar stock can be held in special racks provided in the bar-stock area.

An adjustable sheet-lifter is used for transferring lamination and end-plate stock from car to storage space and for placing lamination stock on the feed racks in front of a specially designed gas-fired water-glass oven. This roller-fed oven applies water glass to both sides of each sheet and bakes it dry over an open gas flame. The result is a thin permanent insulation on the lamination punching, which also serves as a die lubricant.

Insulated sheets, upon emerging from the water-glass oven, are immediately passed through a 72-in. rotary slitter and a double blanking die in an inclined punch press to cut them into squares of suitable size for feeding into presses making stator punchings. Eight sizes of sheets are purchased in order that squares can be cut to size without leaving an appreciable amount of scrap. A power-driven roller conveyor transfers pallets loaded with slit squares to a blank storage space. Squares of lamination stock for special motors and sheets of end-plate stock are delivered by truck to the special motor section.



assembly and assembly stations. Raw materials and parts are delivered near the manufacturing centers where they will be used and finished motors are delivered to a warehouse and shipping department located at one end of the main aisle.

There are two separate groups of inclined punch presses arranged for making stator and rotor punchings for standard motors. All of these presses are inclined at a 45-deg. angle to facilitate feeding the square blanks into the dies and to insure rapidly clearing punched blanks from the strippers. Rotor cookies punched from stator blanks are dropped, according to size, at different positions on a belt conveyor and are carried to mechanical stackers near the rotor punch press group.

Disposal of scrap in a punch press section is always an important problem. In this department the problem has been solved by providing drag-chain conveyors in trenches under each line of presses. These carry scrap pieces to hopper buckets placed in pits at the end of each conveyor-line. Scrap buckets are transferred by crane to a hydraulic baling press where both sheet scrap and turnings are baled for sale.

Rotor punchings, delivered by conveyor from the press group, are sorted into unit piles in one of the two pneumatic presses where enough punchings are stacked under the ram to require a standard pressure to bring the ram down to a gage point. This insures a constant length of rotor, even though there may be slight variations in the thickness of each lamination sheet.

Checked piles of rotor laminations are placed on roller conveyors which carry them to a preheating oven and then to one of the four die casting machines where the squirrel-cage rotor windings and ventilating fan blades are cast in split dies. Upon completion of the casting operation, die sections are removed and returned to the loading position through a spray of cooling water.

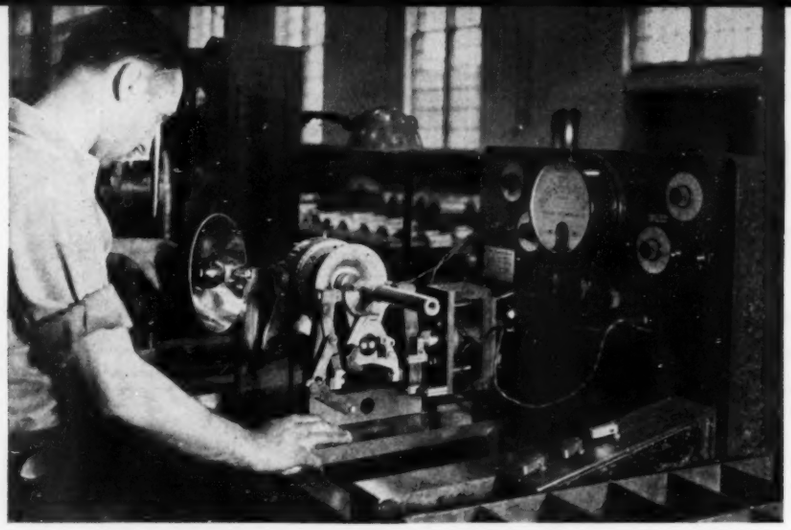
Mill lengths of shaft bar-stock are transferred by crane to one of the power saws which cut them to length. The power hack saws which handle stock for those shafts that are used in large quantities, are set up for cutting a number of bars at one time. The smaller power hack saws have bar stock supports which are hand operated.

Pallets loaded with centered bar lengths are carried by conveyor through the wall of the main building, through a portion of the yard and then into the end of the bay housing the shaft machining group. This conveyor is protected by a weatherproof canopy so that shafts can be transported safely during inclement weather.

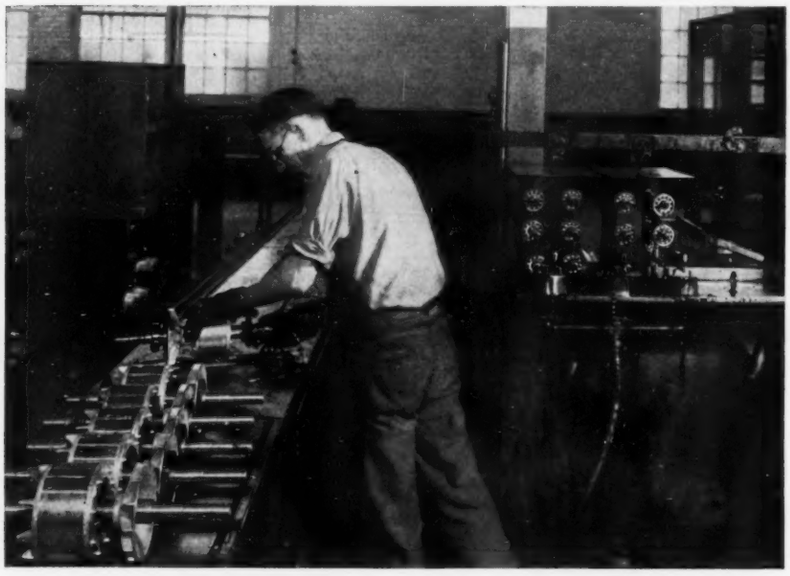
All operations on shafts for standard motors are performed on one side of the aisle while special motor shafts are completed on the other side. There is no transfer of shafts back and forth across the aisle. Scrap cans are placed near the turning lathes in order that turnings can be transported to the baling press. Those cans located near the semi-automatic lathes are served by belt conveyors which lift the scrap from the machine and deposit it in the can.

Rotor Balancing

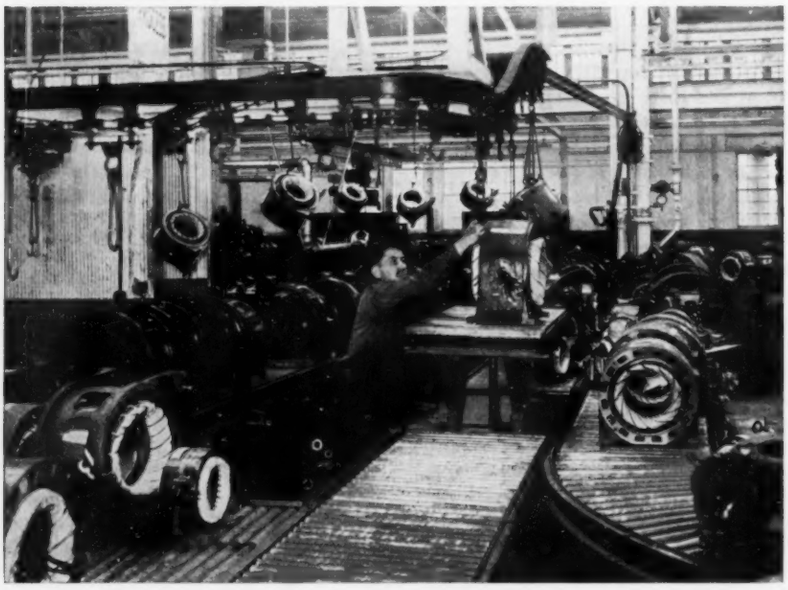
Die-cast rotors, after assembly with their shafts, are turned on the outside diameter and then delivered to balancing machines. Rotors are dynamically balanced in one of three units. The smaller of these dynamic balancing machines is a "stroboglow" balancing unit that has been developed and constructed under the direction of Westinghouse Research engineers. Dynamic balancing is said to be more rapid with this unit.



This newly developed "Stroboglow" dynamic balancing unit is said to be highly accurate for rotors weighing between 10 and 50 lb.



Rotors for ball-bearing type motors are diverted to a special line and passed over an assembly position where the ball-bearing units and cartridges are mounted. Ball-bearings are heated in an oil tank, being suspended in the oil by means of the fixtures shown just behind the operator



Wound and connected stators, having passed the high-frequency electrical test satisfactorily, are hooked to an overhead conveyor system which carries them through two varnish dip tanks and through an overhead baking oven

Balanced rotors are delivered by roller conveyors to the matching position where they are inserted in the finished stators. Those rotors that are to be used in ball-bearing motors are diverted from the main conveyor line for delivery to a bearing assembly bench where a turntable assembly unit is located. An electrically heated oil pot at this position maintains the bearing units at a proper temperature to permit their being slipped onto the shaft without driving.

Bracket and cartridge castings are transferred from broad-gage railroad cars to an outdoor storage space, as indicated in Fig. 1, by means of a floor-operated 1-ton electric hoist. Both brackets and cartridge castings are delivered in large boxes which are used to carry the castings into the machining groups. Bracket turning, boring and facing operations are performed in semi-automatic lathes which are set up in groups of two for first and second operations on brackets of a given size. Drilling and bearing assembly operations are performed in machine lines located directly back of the lathes from which the brackets are delivered.

Upon completion of the second facing and boring operation, the lathe operator lifts the bracket casting from the lathe chuck and places it on a chute which extends over his machine. This chute delivers the casting to a roller conveyor which carries it to its drilling line. Storage capacity for 15,000 finished brackets is provided in the areas indicated. Brackets are stacked according to size and type and are delivered to the assembly conveyor lines as needed.

Stator Winding

Insulation details are cut from stock and made ready for the coil-winding group in an insulation group. Slot insulating channels are cut to length and formed from sheets of suitable material and leads are cut to length and skinned for connection to coil ends. All insulation details are placed in storage bins for delivery to the coil and stator-winding groups as needed.

Ten semi-automatic coil winding machines wind coils that have sufficient activity to justify automatic and semi-automatic machine set ups. Special coils are wound on a line

of No. 2 winding heads and are taped at an adjacent bench. All coils, upon completion of the winding operations, are transferred to accumulating and sorting conveyors equipped with storage racks.

Frames pass over these same conveyor lines and coils are matched with the stators before they are delivered to the stator winding groups. Four lines of roller conveyors, three of which are of the live-roll type, extend through the stator winding group. On each side of each of these conveyor lines are spaced stator winding fixtures which are arranged so that the operator can slide a frame from the conveyor into the fixture and then rotate it in any direction so as to reduce the fatigue of stator winding.

Design of the stator winding fixtures is according to standards developed by Westinghouse production engineers. Operators can reach every part of the interior of a frame without interference from the fixture. They consist, essentially, of a ring of sufficient size to admit the stator frame and have steps to which the stator feet can be clamped. Four rollers on the fixture base permit rotation of the ring about its horizontal axis and the fixture base is rotatable about its vertical axis.

Wound and connected stators are passed through a high frequency test bench where every stator is given a test for grounds and short circuits. Defective stators are passed to a repair group which is equipped with the necessary tools and fixtures for making any necessary repairs. Satisfactory stators are passed to a position where they are hooked to an overhead chain conveyor. This conveyor line carries each stator through several varnish dips, each dip being followed by a four-hour passage through an overhead oven which is held at a temperature of 300° F. Baked stators are unloaded from the oven conveyor and delivered to a group of operators who clean the baked varnish from the bore, feet and bracket fits. From here stators are delivered to large internal grinders where bores are ground to insure a good air gap.

Wound Rotors

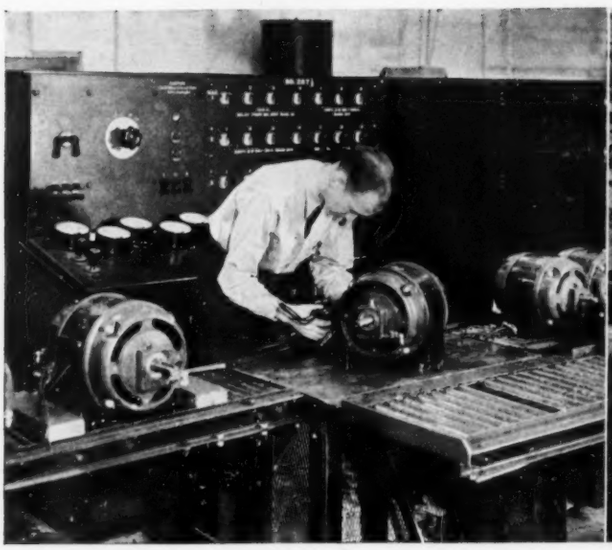
Many of the operations required for the manufacture of wound rotors for a.c. motors are duplicated in the manufacture of d.c. rotors. For this reason, the manufacture of wound rotors has been left in the department that is devoted to the manufacture of d.c. motors, as the operators in that department are familiar with the tools and operations used. Production requirements for this type of rotor do not justify the transfer of these operations to the a.c. motor department, as this would mean the installation of additional equipment and a considerable training period before the operators would be familiar with proper methods.

Standard-stock rotors and stators pass through a parts storeroom where the storekeeper secures standard small parts from storage bins and places them with each motor. A card accompanying each motor lists the parts to be added by the storekeeper.

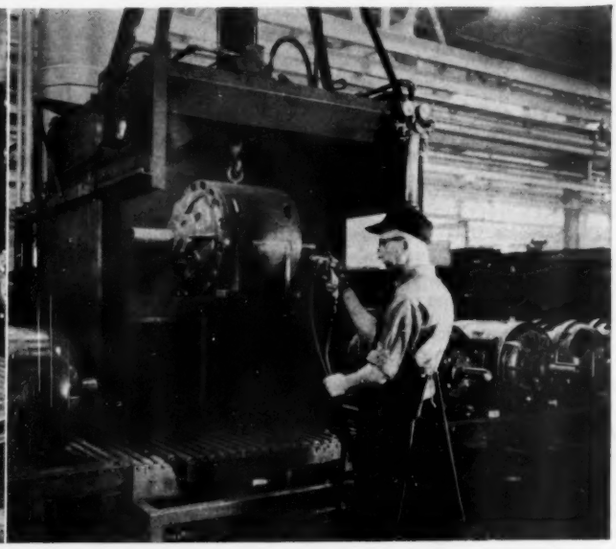
Overhead costs have been reduced materially through the elimination of bookkeeping operations in this storeroom. Stock in the bins is maintained by visual inspection of each bin at regular intervals; requisitions are issued for stock to replenish his supply when the storekeeper finds that stock has been reduced below what he knows is a safe margin.

After passing through the storeroom, the groups of motors parts are transferred to one of four assembly lines, each of which has a turntable position near which are placed racks of standard bolts, nuts and other supplies as well as tools

Final assembly positions in each conveyor line are equipped with necessary tools and material racks, all within convenient reach of the operator



Each standard motor is given a running test to assure conformance of electrical characteristics with specified standards. Special motors, which require out-of-the-ordinary detailed tests are delivered to a special test-floor in a nearby bay



All motors, whether standard or special, are spray-painted before delivery to the crating group. Paint booths are equipped with pneumatic hoists so that all parts of the motor can easily be reached. Side-shields, hung from racks, can be extended across conveyor line

needed for mounting brackets and other parts. Each assembled motor then passes to test positions where a running test is made to check the electrical characteristics of each motor.

Two paint spray booths are provided. These booths have been equipped with vertical air hoists for raising the motors above the conveyor line, making it possible to reach all parts of a motor with the sprayed paint. Movable shields are provided at each booth to bridge the conveyor during the painting operation; these shields are carried on rails and are moved into position by pneumatic cylinders.

Special Motors

As has been pointed out earlier in this discussion, the manufacture of motors according to special customer's specifications has been segregated, as much as is practicable, from the production of standard-stock motors. Wherever possible, standard parts are used in these special motors and these parts are drawn from the storage area provided in the main aisle. Special parts are handled in a narrow aisle paralleling the main aisle, as indicated in Fig. 1.

Essentially, the special motor aisle is divided into eight sections for control of the work. These divisions are: (1) frame machining, (2) punch press group, (3) core assembly and riveting, (4) brazed rotor group, (5) bracket, cartridge and detail machining group, (6) parts matching storeroom, (7) special motor assembly, and (8) special motor test floor.

Special lamination punchings, as well as end plate punchings for both standard and special motors, are produced in the special punchings group indicated in Fig. 1. Larger lamination and end-plate punchings that have sufficient activity to justify the use of compound dies are produced in straight-sided crank presses or inclined presses equipped with sheet feed devices and vacuum feed attachments. Punchings having low activity are first blanked in ordinary punch presses and then coil slots are punched one at a time in a group of indexing presses. Single-purpose dies for rounds, keyways, rivet holes and ventilation openings are used to prepare blanks for the indexing presses.

Parts for special motors pass through a parts matching storeroom for delivery by roller conveyor to a special-motor assembly floor. This floor has assembly benches for operations that cannot conveniently be performed at the turntable position in the conveyor line. Completed motors assembled in this group are delivered to a test floor nearby for "out-of-the-ordinary" testing. Here the motors are checked against customer's specifications and are then returned to the assembly conveyor for passage into the main aisle.

All completed motors, whether standard or special, are delivered to the warehousing and shipping divisions through an opening in the separating partition. At this position, the main conveyor line separates into two sections which encircle the crating group. Here the warehouse employees lift each motor with an electric hoist onto a skid, which forms the crate base, and then assemble the crate sides and top around the motor.

Skids and crate sections for both standard and special motors are made according to predetermined specifications in the wood-working group. Here two cut-off saws and a rip-saw cut the mill-lengths of lumber to size. Shaped blocks are cut with a wood-cutting band saw. A cleater, two railing machines and a drill press are used for assembling crate units, which are delivered by conveyor to the crating group.

Motors Weighed

Crated motors pass over a 1,500-lb. capacity dial scale where the weight of each crate is recorded. They are then passed along the conveyor line into the warehousing space where standard motors are delivered to spur lines on which they are accumulated until lifted into the storage area by a 5-ton cab-operated crane. A conveyor turntable unit shifts special motors and standard motors that are to be shipped by truck or fast freight onto a power-driven belt conveyor for transfer under the floor to a special motor storage on the other side of the warehouse area. These motors pass from the belt conveyor onto a gravity roller and are lifted by crane to the shipping platform.

TALKING SHOP

Metal Show Sidelights

At the National Metal Show, held recently at Atlantic City, the tribulations of the Tip Top Tool Company's president were dramatized by Tony Sarg's marionettes as Carnegie Illinois' contribution to the U. S. Steel booth. Needless to say the principal trouble of this high-strung executive was unreliable steel. The animated connecting rod used as a test piece just couldn't take a series of tortures designed to determine its durability. The happy solution (have you guessed?) was a Carnegie Illinois rod which took all the punishment inflicted and asked for more.

Hot Tip

A feminine touch was added by the girl welders at the Air Reduction booth. Their handling of the torch would put some he-men to shame.

Trailing Along

Makers of household trailers are struggling with the problem of popularity. But trailers for commercial use seem to have a growing field. At the Metal Show we overheard a machine builder offer to demonstrate his machine for a prospective customer. "Our trailer exhibit will be in your section of Ohio next week. We'll have our demonstrators call at your plant and you can see just what this machine will do on your own work." No shipping of a machine, setting it up and perhaps sending it home again. Just draw up beside the shop and do a few pieces to show its usefulness.

One interesting exhibit was in a trailer that is used for demonstration. When the show was over it started on its way again.

Spanish Menace

Did George F. Pettinos, Inc. carry workmen's compensation for the "Spanish senorita" who adorned its booth? She sat in a chair suspended from a single brick cemented to another brick with one of the company's products.

Up in Smoke

For years Axel H. Engstrom of Botfield Refractories has been a connoisseur of fine pipe tobacco. He dabbled with various mixtures until he hit upon one that will not bite even if smoked right down to the bottom of the bowl. His friends liked it too. So now a separate company has been set up to supply Botfield's customers and friends with this fine aromatic mixture. It's good, too. We've tried it.

Tamper Proof

Prisoners are tough in Massachusett's prisons. One of the things they don't like is soldering on a steady basis, so they put the heating furnaces out of business whenever possible. The warden got Sentry Company to build a new furnace that prevents tampering, and it may have a lot of other uses outside of penitentiaries.

Welding Wood

At their dinner, members of the A. W. S. were entertained in quite a novel manner. Dr. S. I. McPherson gave a profound discourse on the "Welding of Organic Materials" in which he initiated his hearers into the mysteries of fusing wood. After the scientific part of his performance Dr. McPherson played a bagpipe made of toy balloons and pipe fittings accompanied by Fred T. Llewellyn, director of research, U. S. Steel Corporation. Only the insiders knew that behind the pseudo Scotch doctor's red whiskers, Phil Swain, editor of *Power,* was having the time of his life.

Liquidation

For obvious reasons we refuse to divulge the name of the company that had a "little back room." Needless to say, many a good man and true found it a welcome retreat after pounding the pavement of the exhibition hall.

Faces Red, Too

Almost as amazing as the displays of new metal products and equipment was the mind-reading exhibi-

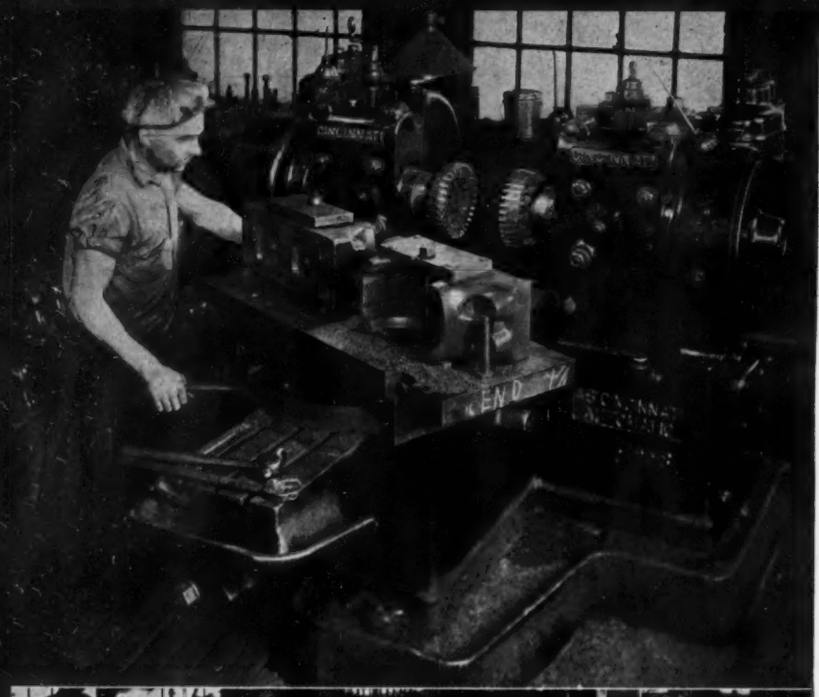
tion at the A. S. M. annual dinner. It made no difference whether you thought of a card or mentally asked the date of your mother-in-law's birthday the question passed through the controlled atmosphere and Mind-Reader Dunninger gave the answer. So accurate was the analysis of cerebral contents that many a member shifted uneasily in his chair until the show was over.

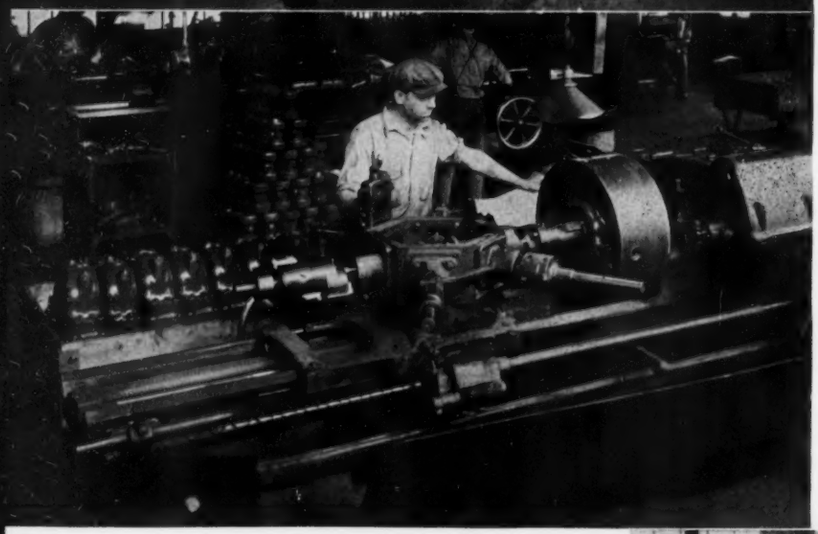
Show a Success

All in all, the Metal Show was a big success. Because there was no local industry to draw upon, attendance was below that chalked up last year at Cleveland. To offset this, curiosity seekers were almost entirely lacking—those who inspected the exhibits were 9.944 per cent pure, in the genuineness of their interest at least. Added to this, the Auditorium offered a fine location for the displays. Next year, however, the Metal Show will go back to an industrial center—Detroit.

The Editors.

Tooling for Pillow Blocks





ASSEMBLIES incorporating modern roller bearings must be machined to close tolerances if the product is to give satisfactory service life. There are many types of such mountings, but the roller-bearing pillow block is manufactured in quantities that permit special tooling and up-to-date methods. This point is best illustrated by some of the production processes on the Dodge-Timken ball and socket pillow block of the clamp-sleeve type made at the Mishawaka plant of the Dodge Mfg. Corporation.

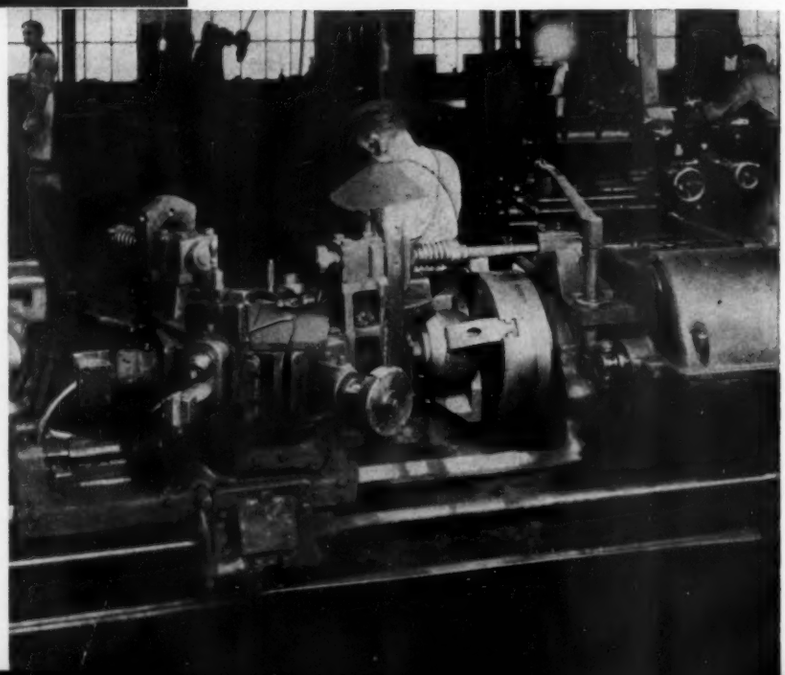
The outer housing joint and base of the larger pillow blocks are first milled. They are then bolted together for boring the spherical seats. The inner housing, or ball part, is likewise machined to match the seats in the outer housing. Bearing sleeves are made of roller-bearing tube stock ground inside and outside, and threads of special form are milled on the ends. Collars and adjustment units are also made to comparable dimensional accuracy.

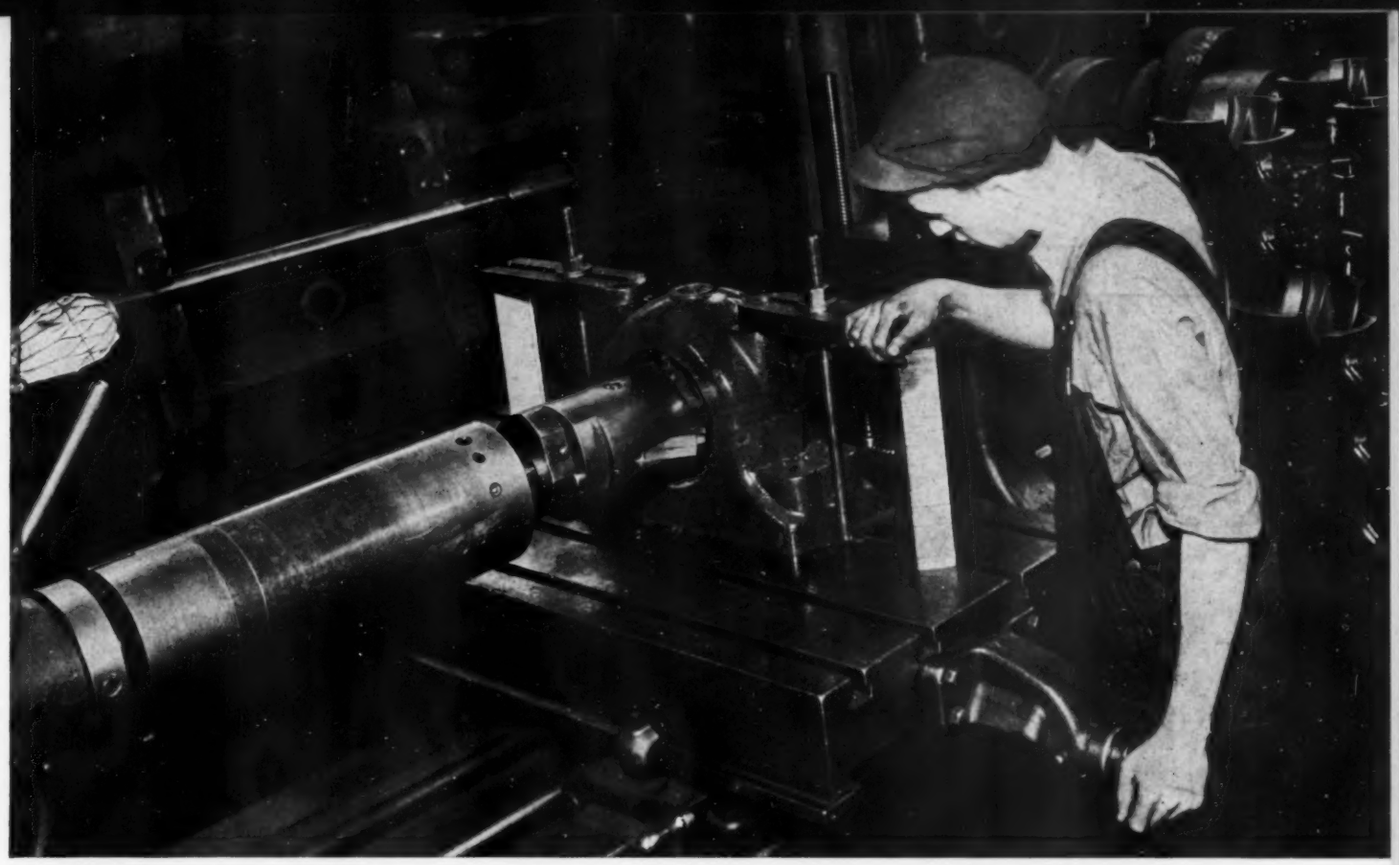
Outer bearing races are washed and pressed into the inner housing, and the inner races are heated and shrunk on the bearing sleeve. Inspection of the bore and adjustment of the bearings follow. The housings, which had been sprayed once before machining, are hand painted before the completed pillow block is sent to storage.

Top—A revolving fixture enables one outer-housing base to be unloaded while a second is being milled at the split and the bottom

Center—Outer housings for shaft sizes to $3\frac{7}{16}$ in. are machined on a Warner & Swasey. The spherical-seat boring bar is the same type as shown on the opposite page

Right—Inner housings are held in a four-jaw chuck with pilot for boring, reaming, facing and generating spherical seats to match the outer housing





Spherical seats in outer housings of the larger pillow blocks are machined on a horizontal boring mill. The piloted boring bar has pivoted tool blocks carrying single-point generating tools. When the bar hits a stop the tool blocks swing about a common center

Cap and base of large pillow blocks are shimmed, because it is cheaper than to worry about slight come and go in such castings after they have been machined and have cooled down

Clamp-type sleeves are turned, ground on the outside and then on the inside, and finally placed in this thread miller. A heavy-walled tube is placed inside the sleeve to support it against the cut and to prevent its collapse by the air chuck

Inspection for bore and bearing adjustment make field adjustment unnecessary. After the bearings are adjusted with the collar, a special washer is slipped over the clamp screw and engaged in the nearest slot. Tightening of the clamp screw on a shaft will not then affect the bearing adjustment

Air-Operated Milling Fixtures

This article concludes a series which discussed practical principles of jig and fixture design, as applied to tools for drilling, tapping and milling

C. W. HINMAN
Tool Engineer
Kobzy Tool & Electric Manufacturing Company

AIR CYLINDERS with reciprocating pistons are applied in chucks, drilling and milling tools, and in special machines for clamping, holding, and releasing duplicate parts for machining, press fitting, or riveting. The air pressure is controlled by a valve placed in a pipe leading to the cylinder. It is sometimes best, however, to operate the valve by a remote control.

The valve is opened and closed, or operated in a two-way system, by means of a convenient hand lever in cases similar to chucks, and in drilling and milling tools, while a treadle-operated valve is used on the floor beneath independent units like an arbor press, bench vise, or fixtures independent of machines.

Remote Control

The remote control operating system provides for placing the control valves close to the operator, while the valve that directly operates the piston head is placed close to the cylinder for obtaining quick and efficient action. Equipped with this system, large machines are made to function fully automatic, or semi-automatic as desired.

Air cylinders and valve-operating equipment have become highly commercialized in recent years. Therefore, it is more economical and expedient for the average shop to purchase them than to attempt the costly experiment of designing and building its own material of this kind.

Contrary to the general impression, the cost of operating compressed air fixtures is ridiculously low. Engineering tests and corresponding data recently compiled show that for light operations approximately 35 cents per thousand cubic feet covers the maximum cost. The number of cubic feet of air consumed in a cylinder for any particular operation, is the same at all pressures.

No Obstructions

A self-contained air-operated milling machine vise of tremendous gripping power is commercially available. The vise opening when once adjusted near the work size, by using the conventional screw, is thereafter continuously operated by air. The level height across the top of the vise and cylinder housing allows the cutters to pass unobstructed over its entire length.

It would be difficult to present a simpler, or more efficient and rational principle in applying compressed-air clamping power than is clearly shown by the milling fixture illustrated in Fig. 164. Attached to the rear of the cylinder and fixture body is a hinge that permits vertical radial movements necessary for the cylinder action. The piston-rod end is directly connected by a fulcrum pin at the extremity of a cam-lever—ratio 3 to 1—and when advanced by piston thrust, the cam contacts and forces down the compound equalizer bars placed across two rough castings of work. The rear ends of the work pieces register against positive stops. The great holding power developed by means of this direct "hook-up" and registration insures immovable positions of the pieces when resisting deep straddle milling cuts. The work shown in the cut is a spindle casting for front-wheel suspension of automobiles.

Notice the pipe and hose connections, and the shut position shown of the hand lever that operates the two-way-valve beneath it. When this lever is moved down, the piston advances and locks the work, but when oppositely moved, the piston recedes and the work is released. For clamping non-frail work the quick-action clamping and the constant repetition of rigid unchanging gripping power is much in favor of using compressed air as compared with all other types of fastenings.

Sixteen at Once

Fig. 165 shows an air-operated milling fixture for holding sixteen shock-absorber shaft bearings while finish-milling three surfaces in one cut. The bearings are transferred from the left-hand row in the fixture, where two surfaces are milled, to the right-hand row where one surface is milled. Four cylinders in the housing base apply pressure on the equalizing clamps. These are

brought into position over the bearings, or withdrawn for removing and reloading, by means of the manually operated pin handles shown at the end of the fixture. Only one cutter is used; it is the spiral-faced side milling type.

The usual hand lever with a two-way-valve attached, common in such types of milling fixtures, operates two cylinders under each row of clamps. Four of the clamps in each row are "hooked up" in compound equalization with the piston in each cylinder. A gage pin, covered by the work, locates each piece in symmetrical relation. The pin handle shafts operate a raising cam under each clamp, which lifts them in unison, for removing and reloading, after the air pressure is released.

Clamps connected to pistons in hydraulic cylinders, and operated by control valves, are applied in the same manner as compressed air clamping. They are used, however, for handling heavier work in large fixtures and machines. Hydraulically operated machines require more commercial equipment than simply valves and cylinders. A pump and a driving motor, and an oil-containing reservoir are necessary. These are mounted in a single, open unit. Thus, plenty of air circulation keeps the apparatus cool during operation.

Electric Controls

A recent development in special machines is electrically operated hydraulic controls. A solenoid-armature is attached to and governs the action of a valve and hydraulic cylinder. An individual unit of this design controls each one of the separate functions of the machine. A limit switch operates a rotary indexing switch, and this "hook-up" operates the solenoid and valve.

The electrical connections are so cleverly interlocked that indexing is withheld to prevent the beginning of the next machining cycle until the last cycle is properly completed. During the active interval in any cycle, if the tool fails, or anything goes wrong, the machine stops automatically and the trouble must be eliminated.

In one milling operation, four or more slots can be cut at right angles to one another, in small parts of hard rubber or fiber. This principle has a wide application in manufacturing light interchangeable parts, and brass, aluminum, and other soft metals can be similarly handled.

The blank, Fig. 166, is prefabricated in an automatic turret forming machine, and the two-way slotting fix-

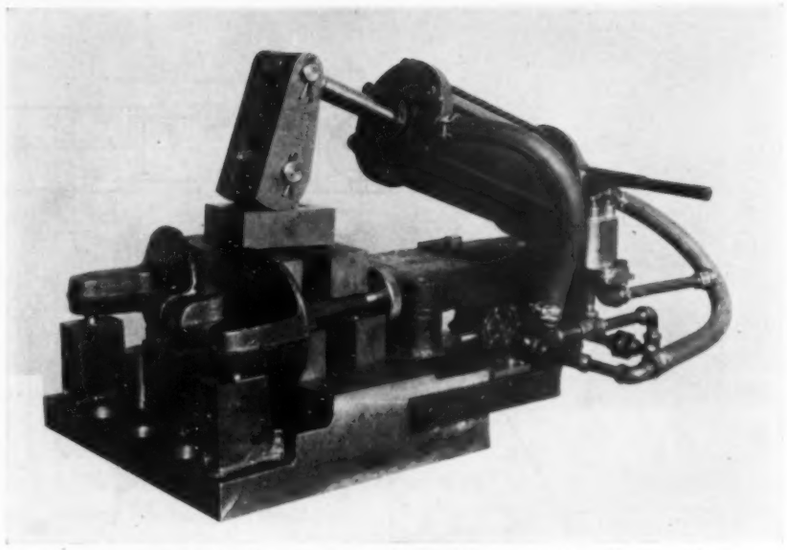


Fig. 164—Great holding power is obtained by operating the cam clamp by means of a compressed-air cylinder

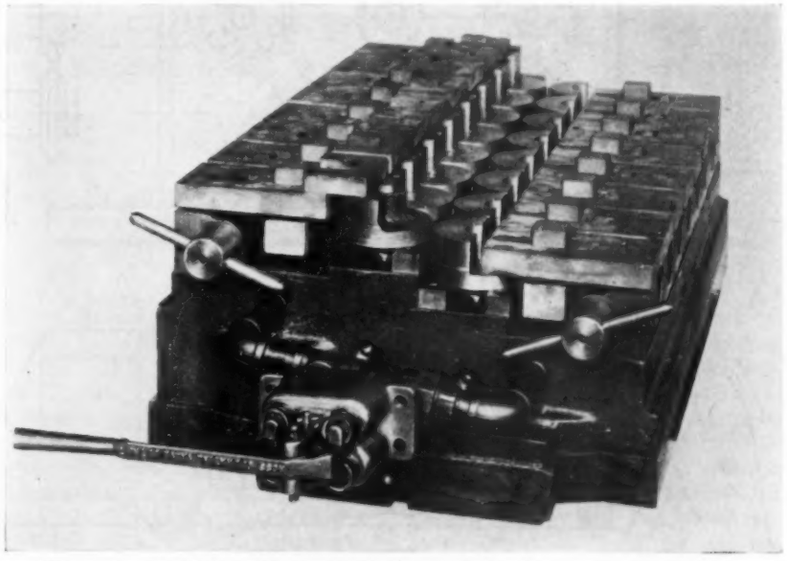


Fig. 165—Equalizing clamps in the base of the fixture are actuated by four cylinders

ture is sketched in Fig. 167. In the plan view of the holding fixture, lower sketch, the work to be slotted in two directions is clamped between jaws *A* and *B* by closing cam lever *C*. The turret carriage *D* is then at the right-hand end of the dove-tail slot *E* in fixture body *F*, at station No. 1. This is the normal loading and unloading station.

After loading the turret and locking the jaws, it is then fed toward the left by lifting the crank-arm *G*, which revolves pinion *H* and thus advances rack *I* and the turret carriage to which the rack is attached. When the turret is so advanced, it carries the work between the first pair of formed milling cutters *J*, shown in the elevation above the plan, and thus the two $\frac{3}{32}$-in. slots are cut. Continuing the crank movement causes roller *K*, attached underneath and on the turret, to enter the angular slot shown, thus indexing the turret and work counter-clockwise through an arc of 9 deg., and into the second station where the two 5/64-in. slots are cut between the second pair of formed milling cutters *L*. The forward feed is continued until the crank arm contacts an adjustable stop *M*, which completes the last pair of cuts at right angles to the first.

The roller slot is straight for a short distance at each of its ends, as shown, which allows the four straight cuts to be made at the proper time and place. By reversing

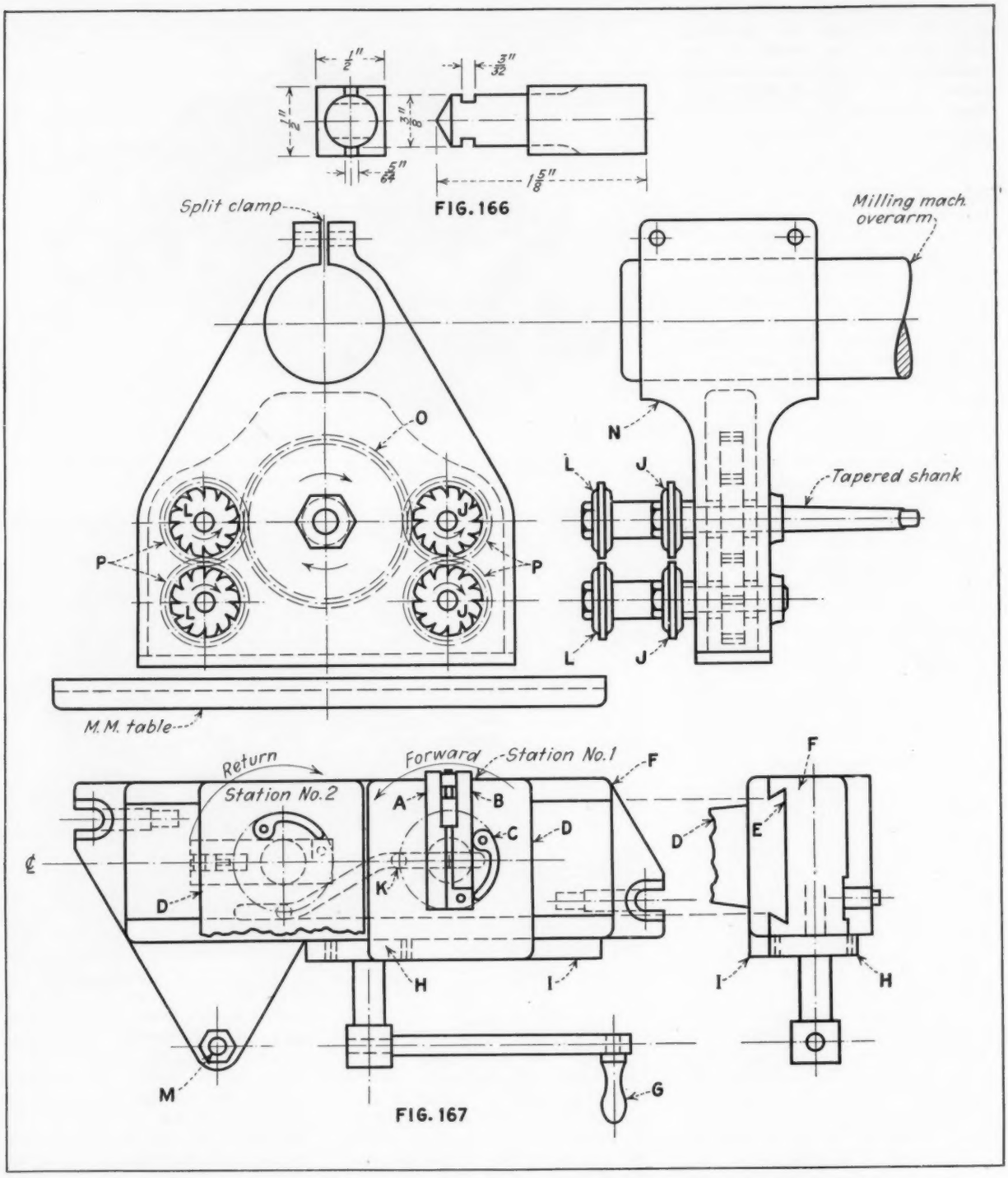


Fig. 166—The piece is to be slotted in two directions. Fig. 167—One pair of cutters mills crosswise slots and then the turret is turned 90 deg. for milling the second pair of slots at right angles to the first pair

the crank motion, the turret is returned to its normal starting position, station No. 1, for removing the finished piece and reloading.

The turret is locked in both cutting positions by contacting a positive stop on its under side, which for the sake of clarity is omitted in the sketch. The cutter head body *N* is cast iron, and is clamped on the over-arm. The cutter arbors run in ball-bearing holders, and can be adjusted nearer together to compensate for reduced diameters in the cutters after grinding. The tapered shank engages in the milling machine spindle, and drives the four cutters through gears *O* and *P*. The gears are inclosed within the cutter housing body, and packed in grease.

When very long pieces of regular sections are to be clamped for milling or drilling, it is advisable to consider using V clamps at the fixture ends, as illustrated by Fig. 168. In this case, two commercial channel irons are secured "back to back" in a T-section fixture body.

Because of slight warps in long pieces of structural sections, it is

best to use two-, three-, or five-point bearings to compensate for surface irregularities. Two bearings *A* are used at the top edge of the work, near the cut, and another bearing *B*, at the center of the lower edge.

V-clamp *C* is positively attached to the rear end of the fixture, while at the opposite end a removable V-clamp *D* is locked against the work over a stud by inserting a key in front. The hole through *D* is "bell-mouthed" as shown, which allows it to equalize irregular lengths.

Clamping Angular Parts

This principle is also useful in clamping long rectangular and angular sections. Incidentally, a long angular section is a rather difficult piece to design a good drilling jig for, especially when many holes are to be drilled in both its legs. As simple as it seems, it is difficult to locate screws properly when holding an angle for drilling. Screws or clamps are too slow to operate, but the principle just decribed is applicable in properly holding angles for drilling. If holes must be located and drilled from the *C* end of the angles, positive stops are provided at that end, and equalizer clamp *C* is thinner and spring tempered steel; it contacts the work thrust from *D* before the angle ends register against the positive stops.

A quick-action straight key may be substituted for the conventional tapered key used in Fig. 168. A bayonet cam slot is provided through the key and engages over a pin driven across the diameter of the stud. The locked position of the key is at right angles with the stud. When the key is raised straight up from its locked position, the pin stops in the bayonet slot. Then the key can be turned down on the pin as a center, until straight in line with the stud, and the clamp is removed over it. This principle was fully described and illustrated in Fig. 92 (*AM*—Vol. 81, page 613) under drilling jig fastenings.

In conclusion, the toggle clamp principle should be mentioned. For clamping thicknesses of slight variations, such as sheet metals, cold-rolled steel, and light structural shapes, this clamp is quick in action. and best suited for the purpose. These clamps can be purchased in units ready to install and in many standard styles and sizes. The principle is sketched in Fig. 169. The equalizer block *A* clamps the work when handle *B* is moved until the three fulcrum pins are brought into "dead center" on line C—C, as shown. Releasing is quickly accomplished by simply moving the handle in either direction until the "dead center" line of the toggle is broken.

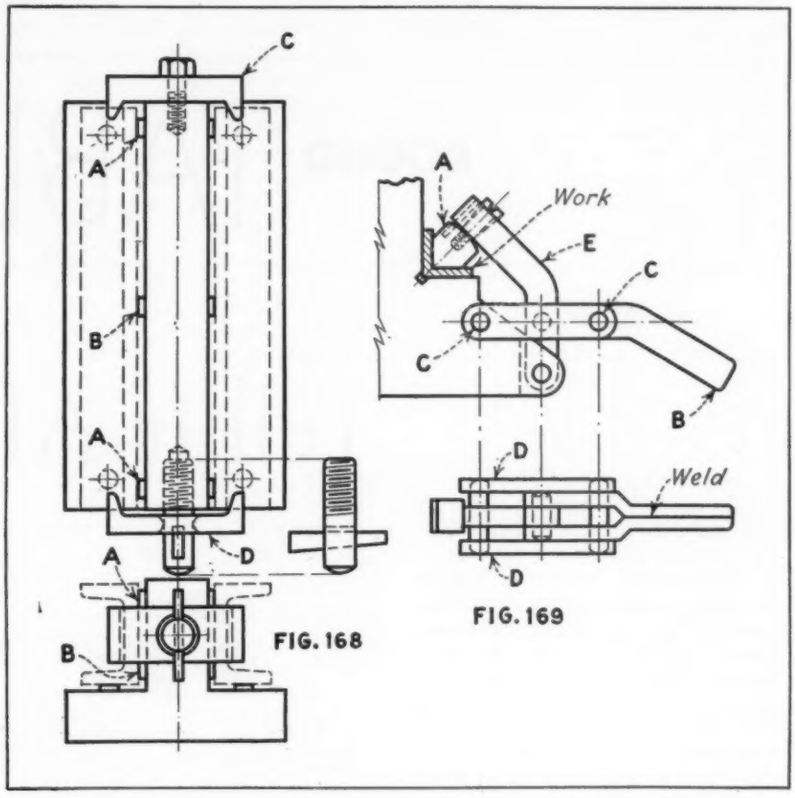


FIG. 168

FIG. 169

Fig. 168—Long structural sections are more conveniently and quickly located and held by V's and a key than by screws. Fig 169—Toggle clamps are also a quick means of clamping structural sections and sheet-metal parts

This clamp is composed of four levers. The handles are arc-welded together into one piece. There are two links *D*, and one clamping arm *E*. Block *A* is fitted in length on the work to produce the required clamping pressure when locking. These clamps are useful for holding certain work in drilling, milling, boring and reaming tools; in assembling dies for securing parts to be united, and for the same purpose in arc- and spot-welding fixtures. Toggle clamps are impractical for holding work where the pieces vary considerably in thickness at the clamping points.

Coming—A New Hinman Series

C. W. Hinman's series on "Practical Steps in Tool Design" is concluded in this number. Early next year, the same author will present to *American Machinist* readers another series, the "Press Working of Metals". He will follow the same practical approach, the same stress on fundamentals and the same use of clear examples that have brought praise and approval from production men in the past.

Mr. Hinman's articles reap the benefit of the author's wide experience with such concerns as the Western Electric Company, the Wahl Adding Machine Company, the Automatic Electric Company, the Addressograph Company and the Kobzy Tool Company. Each installment while a self-contained story of a particular phase of press work will form part of one of the most comprehensive series on the subject ever published. It will cover classes of presses and their operation, press attachments, a discussion of the effect of work materials, methods of calculating press-work pressures and a wealth of data on the design of press tools.

The information provided in this new series will form another of the many services *American Machinist* offers its readers. Do not miss it.

ROUND TABLE

Tell It All

"Ed, we've been formulating policies and developing rules for the conduct of our workmen, but we have never tied them all together in a form that the workman can use as a reference. From time to time I've run across booklets published by individual plants to tell their men about their plans and policies. I want to give our men something like that."

Al and his friend were walking home from a meeting of the local Foreman's Club and, as usual, their conversation was drifting around to a discussion of shop policies.

"Isn't that a little dangerous these days, Al? Management can't be too careful about what it does, with all the labor troubles the country has been having. Besides, you've only got a small plant, and you can get around to tell the man anything you have on your mind."

"Our plant is small, Ed, but you know as well as I that the spoken word is easily twisted around. I want our men to know all about shop organization and rules, as well as something about the principles we follow in dealing with our customers."

"That sounds all right in theory, Al; but wouldn't you be carrying it too far to give a copy to every man? Why not pass copies out to your supervisors and let them keep the men informed? The workmen are more interested in their pay envelopes than in shop policies, and any booklets given them would soon disappear."

"Don't you believe it, Ed. The present-day workman thinks for himself, and the press and radio keep him well informed. He must have a true picture of the facts in order to fit into the partnership that exists between the investor, management and the worker. If he and management understand each other there will be few differences that can't be settled to the satisfaction of both."

"You're an idealist, Al. Better come down to earth. Those men of yours won't use those booklets enough to justify the expense."

Should the workman be given complete information about company policies? Is he interested in more than the money in his pay envelope?

DISCUSSION

Off to a Good Start

Confidence in the ability of a man is one of the greatest incentives a manufacturer can offer. William's action in placing Jim Lee over Sam easily could be construed by Sam as lack of confidence in his ability. Sam has been doing a fine job, quite satisfactory to Williams. It seems to me that it was a big mistake to put the production engineer in charge of Sam's department.

However, if Williams feels that the job is too big for Sam at the present time and he wishes to have it put on a working basis, he should have a conference with both Sam and Lee. He might say: "Now Sam, you are doing a good job, but we feel that there is too much work for one man to handle at the present time. It is my idea to put Jim Lee, who is a production specialist, in charge of this one section for a few weeks. When he gets it working on an efficient basis I am going to put you back in charge. It is a specialist's job to organize the department and I feel that Lee can make your work considerably easier. Now I want you two boys to work together on this, because by doing so you can accomplish more than by working alone."

Management seldom takes anyone into their confidence. In this instance it is to Sam's advantage to have Lee in his department, but Sam doesn't know why he is there, or that he will again have charge of the department. A word or two of explanation about why a decision is made will usually help out a lot.

—ROGER C. DICKEY
The International Paper Box Machine Company

A foreman cannot be expected to know all of the operating details and advantages of the many different kinds of machines now on the market. For this reason, the planning and installation of a new manufacturing set-up should be left to a specialist.

Where this new set-up includes detail operations that require further development, once the section is started, the specialist should continue in control until all of the details are functioning properly. The specialist will be in a position to take care of any problems that may come up, which would be difficult for the foreman to handle while he

is taking care of his regular duties. The foreman should be given full charge only after the section is functioning properly.

—ALFRED O. BLUMENTHAL

New Man

The new man is often a problem. He is taken largely on trust and it takes most of them an appreciable time to get into their stride. It is always good policy to point out to the new man what is to be expected of him. Sometimes, in fact, it is quite as important to tell him what he is expected not to do as to point out the things that will be required of him.

One way of getting the new man started right is to have him work with an older workman who can be trusted to lead him in the right direction. Where this is possible, it usually works admirably and usually can be expected to eliminate many of the mistakes that the new man is apt to make.

Where cooperation is the order of the day and the men work together well, labor turnover is usually small. Such a policy makes for efficient plant operation with resulting reductions in cost and improvements in quality. —W. R. NEEDHAM

Stychfields, Stafford, England

Rolling Stones

Older hands usually advise the apprentice to move to another shop upon completion of his apprenticeship. This advice is sound and, if acted upon with a view to gaining a wider knowledge of methods, used in all branches of the industry, usually results in the budding craftsman obtaining experience which would be impossible for him to secure if he remained in one shop or one branch of the industry. These changes should not be made in a spirit of adventure with careless regard for the future, but for the purpose of gaining necessary experience in his chosen field.

A man having a well-rounded experience must have been a "rolling stone" at some time or other. The advantage of his accumulated knowledge is an asset to the firm who employs him when his rolling days are over. Such a man is usually ready to settle down and cash in on his hard-earned knowledge of his craft.

There are a few men who have that spirit of recklessness which seems always to be urging them to move to another job when trade is booming. These men take the first opportunity of finding an excuse for leaving. Such men are of little value to any firm, since one never knows when the roving spirit may again develop. This usually comes at the most inopportune moment, frequently resulting in a disorganized production force.

These men are, however, the exception today, as there are many factors which encourage a craftsman to settle down to a permanent job with a reputable firm in preference to frequently changing his place of employment without obvious benefit to himself.

—W. L. WATERHOUSE

Horfield, Bristol, England

Like a traveler around the world, the "rolling stone" has usually obtained a liberal education in practical methods, provided, of course, that he has made use of his powers of observation. Perhaps he has not laid aside a small fortune, purchased a fine car or built a nice home, but he has a wealth of ideas by which those associated with him may improve their working methods and reduce manufacturing costs.

The steady man is often prejudiced against the man who has moved from plant to plant in gathering his experience. Also, the executive sometimes is bitter in releasing a man who finds the routine of one place of employment too unvaried for his tastes. Both could show more fairness in their treatment of the man who leaves and then returns.

A "rolling stone" can gather much to benefit his work. He should never he regarded as an outcast by steady men who may feel that leaving the firm is a serious breach of loyalty. —G. MCARDLE.

There is a place for both the "rolling stone" and the steady workman in industry. The steady workman is particularly valuable in a shop where production is somewhat standardized. He knows what tolerances and fits can be maintained most profitably and he also knows where the tools and fixtures for various parts are kept. The foreman is aware of his capabilities and can keep him on work for which he is best suited.

The "rolling stone" type also has many points in his favor. He is usually a thorough mechanic and the fact that he is a "boomer" should not necessarily detract from his character. Economic conditions often force a man to seek employment wherever it can be found. This type of workman is of particular advantage to employers in contract shops, since they are self reliant and usually can devise ways and means to get a job completed with a profit to the shop owner.—L. C. MASON.

Bird in Hand

Al would be foolish to turn down a good order from an export agent. His trouble is by no means uncommon; no doubt his competitors, if approached, would be in the same position. The only way out is by arbitration, with Al's representatives pointing out that the agent is not the only one shouting for urgent delivery.

Tactful handling often makes it possible to land regular contract work from export agent. He should not believe that certain firms will remain as regular customers, because he has filled all of their requirements in the past. Such a belief is often rudely shattered.

—W. C. G. HARRIS

Perry Barr, Birmingham, England

What Price Spare Parts

The pricing of current repair parts should be based upon current manufacturing costs while prices asked for obsolete parts carried in stock should, in my opinion, be subjected to a yearly appraisal. This can be done in one of two ways: first, if the stock is sufficiently large to meet requirements for some time, pricing should be based on original manufacturing costs plus additions due to labor or material cost increases since the time they were manufactured. Carrying charges, such as storage, investment insurance and the like, should be included in these prices. On the other hand, if it will be necessary to replenish the supply of obsolete parts in the near future, prices should be based on the manufacturing cost of the run in question. Parts not carried in stock should be priced on an actual "cost to manufacturer" basis.

I do not believe in making concessions to customers with resultant losses on repair part business. The correct price asked for a repair part may appear exorbitant, but no concern should expect another to take a loss on parts furnished.

—O. W. WINTER

PROGRESSIVE DIES FOR FOOT PRESS USE

H. R. LE GRAND
Assistant Editor, American Machinist

Kick-press tools are usually of the simplest kind, but there are times when it pays to develop ones with high-production features

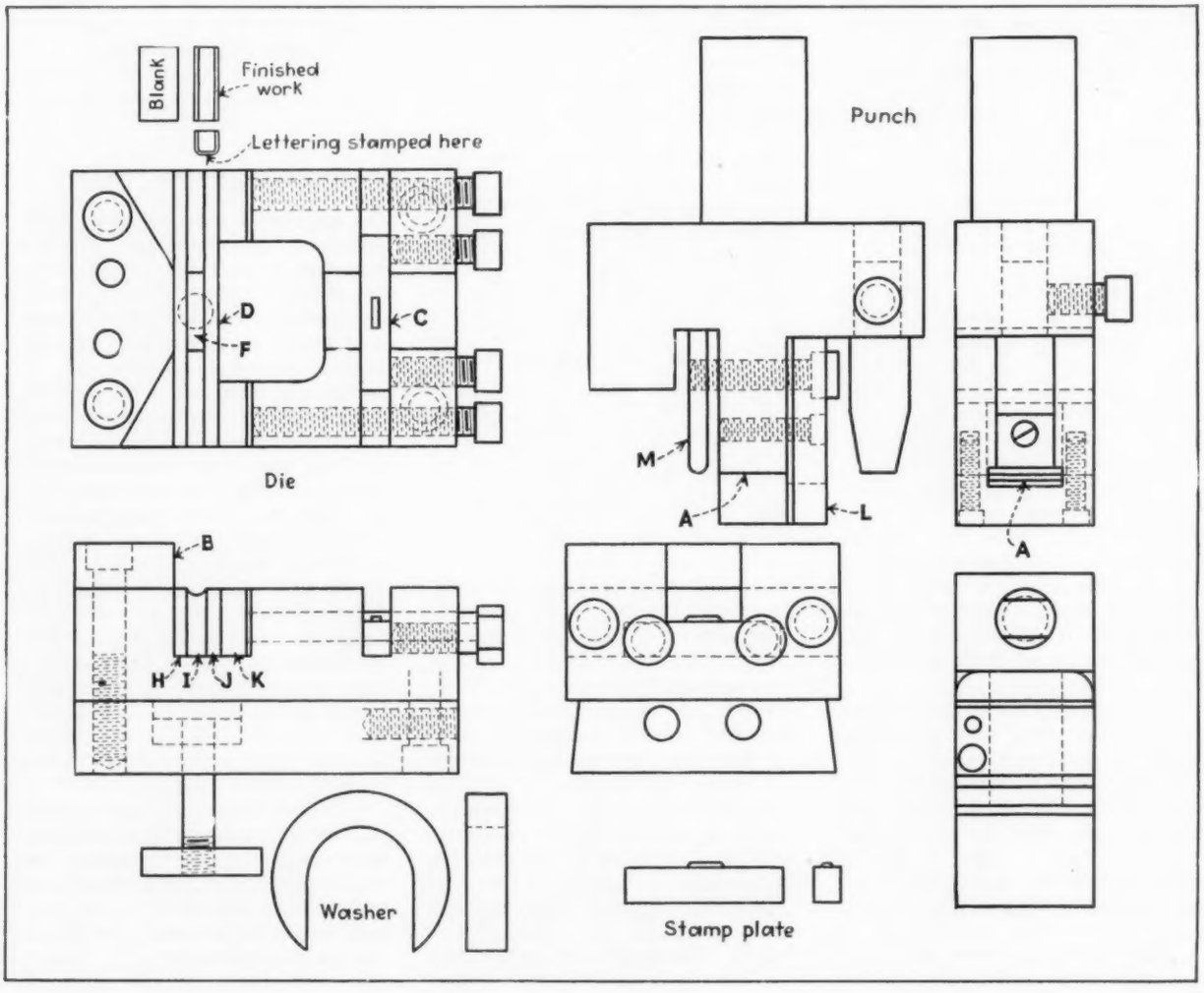
A COMBINATION stamping, cutting and drawing die was designed by E. Hildebrand, and is being used by Krementz & Company, jewelry manufacturers, to produce 1,000 small clips per half hour on a kick press. This output is six times as great as with ordinary kick-press tools. Ordinarily 1,000 pieces an hour would be considered good production for each of three single-operation tools. Besides fast operation, the die permits considerable variation in the length of cut-off, the width and depth of draw, and take-up for wear.

The strip, which may be 18-8 stainless, gold on silver, or gold on nickel silver, 0.015 in. thick by $\frac{5}{8}$ in. wide, is shoved through the slot *A* in the pilot portion of the punch member. It is stopped against *B* to establish the length of cut-off. At each stroke a completed piece is produced, neglecting the first few which have not been stamped.

Thus, as the strip progresses, it is stamped at *C*, cut off at *D* and drawn at *F*. A knockout kicks the piece out of the draw die, and an air blast snaps it to the rear.

In the die, strips *H, I, J* and *K* are made to suit the width of draw and length of cut-off desired. They are held firmly by two long socket-head screws. Similarly, the letter die *C* is held by two other socket-head screws and it can be packed to the correct position.

On the upper member, wearing strip *L* on the pilot is exchangeable when the length of cut-off is varied or when wear must be taken up. Draw punch *M* is positioned by packing strips to suit the location of the draw. All parts of these foot press tools are made of carbon tool steel. They show considerable evolution of the progressive die principle to small kick press use.



IDEAS FROM PRACTICAL MEN

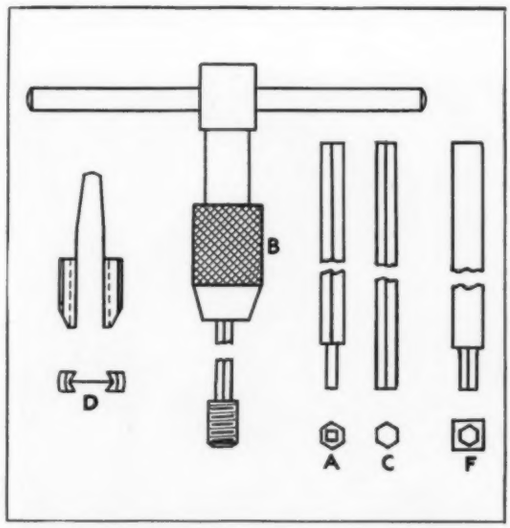
Wrenches for Safety Screws

C. F. FITZ

We have a large amount of repair work where the parts are attached with safety screws having hexagon holes in the heads. This caused us a lot of inconvenience in taking care of the work with the regular L-shaped wrenches that came with the screws.

To obviate the trouble and eliminate injury to the workmen's knuckles, as well as to save their tempers, we made the straight bar wrenches illustrated. Bar *A* is hexagon stock and a square is milled on one end to fit the T-handle tap wrench *B*. Bar *C* is also hexagon stock, but instead of milling a square on one end to fit the tap wrench, we made a special set of jaws *D* for the wrench having 120-deg. V's milled in them to take care of the hexagon bars. Bar *F* is square stock so that it can be held in the regular jaws of the tap wrench, and a hexagon is milled on one end to fit the screws.

These bar wrenches were made in various sizes to fit different sizes of screws and in various lengths to suit the work. The three types shown are used very extensively in our shop and have proved to be time and temper savers.



Straight bar wrenches held in T-handle tap wrenches are more convenient for some work than are the L-shaped wrenches that come with the screws

Settling Tank for the Grinder

J. R. WHITTLES

The metal basket suggested by C. G. Williams (*AM*—Vol. 81, page 699) is an excellent addition to my arrangement (page 334), but I would place it above the lubricant and not in it. Thus, the grit, chips and dirt would be filtered out before reaching the settling tank and would not be continually disturbed by the backing up of the lubricant. This disturbance prevents the cotton waste from functioning properly, allowing some of the finer grit and chips to filter through it into the lubricant tank and be drawn into the pump and discharged through the circulating system and reach the work.

The only objection to the metal basket is that it must filter about 30 gal. of lubricant per min. and that is no easy task because the combination contamination readily plugs up the cotton waste and forms a crust on top and prevents the filter from functioning. When that happens the filter must be cleaned, and because of needing attention it should be placed where it is easily accessible. For that reason it is better to place it as near the point of grinding as is possible, so that the operator can watch its functioning rather than be hidden away in the base of the machine.

In all grinding that calls for better than commercial finish, the lubricant should be filtered as it is impossible to separate all the chips in the settling tank and prevent some of them from circulating through the pump and reaching the work.

According to Mr. Williams' illustration he allows the lubricant to flow under the first partition, making compartments *A* and *B* into one, so that the tank has virtually two compartments instead of three.

Because of the large quantity of lubricant used, a great deal of foam is created in flowing it through the circulating system and returning it to the tank. The foam will gather at the top of compartment *B* and most of it will flow over into compartment *C* and will be drawn into the piping, reducing the pump's efficiency. That is the reason it should be flowed under instead of over the top of the last partition and into compartment *C*, from which it is drawn into the pump.

In allowing the lubricant to flow over the first partition most of the settlings will be caught at the bottom of the first compartment, allowing only the cleanest lubricant to flow into the second compartment. By permitting it to flow under the last partition, the foam will be caught at the top of the second compartment. This arrangement is not by any means perfect, but it is a great help in separating most of the settlings from the lubricant.

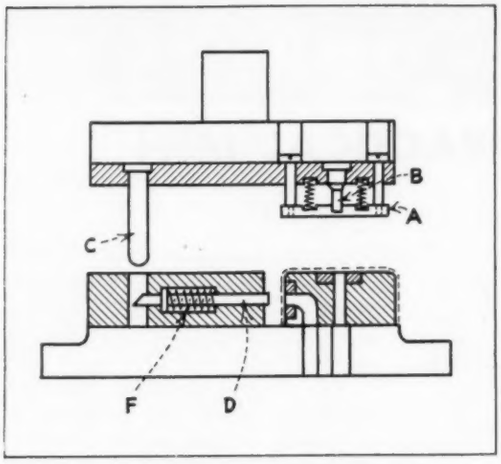
The experience cited above has been gained from using a grinding lubricant and not a kerosene coolant as mentioned in Mr. Williams' article.

Press Tools for Piercing Holes at Right Angles

GORDON W. RICHARDS

Having to pierce one hole in the top and one in the turned-over side of a large quantity of small, drawn, sheet-metal covers, the press tools illustrated were designed to do the work in one operation.

The covers are placed on the die-block and are held by the spring-actuated stripper plate *A* as the ram descends, the vertical punch *B* pierc-



As the vertical punch enters the work, the horizontal punch is forced forward by the rounded end of the plunger contacting its angular end

ing the hole in the top. At the same time, the rounded end of plunger *C* contacts the angular end of the horizontal punch *D*, forcing the punch forward against pressure of the spring *F* and piercing the hole in the side. As the ram ascends, the stripper plate strips the work from the vertical punch, the plunger comes out of contact with the angular end of the horizontal punch and the spring returns the punch to the starting position.

The time saved by the use of these tools far offsets the cost of making them to do the work in one operation instead of two.

Measuring a Hidden Outside Diameter

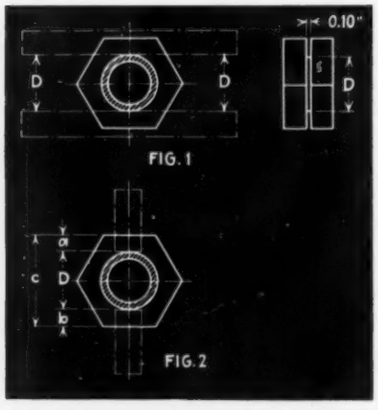
KARL ASPLUND

In an article under the above title (*AM*—Vol. 81, page 798), Laurence F. Southwick describes a method of measuring the outside diameter of a nipple between the hexagon flanges of a special fitting. It seems to me that his method is rather more difficult than simple.

Herewith is a sketch illustrating two methods of finding the required diameter, both of which are simpler than the method suggested by Mr. Southwick. Also, there is no necessity for a knowledge of trigonometry as in Mr. Southwick's method.

Referring to Fig. 1, two pieces of 0.008-in. feeler stock are placed between the flanges, their sides contacting the nipple. By aligning the pieces parallel, the diameter *D* of the nipple can be found by scale measurement between their adjacent sides.

Referring to Fig. 2, two pieces of 0.008-in. feeler stock are placed between the flanges, their ends contacting the nipple. If lines are scribed on the feeler stock along opposite sides of the hexagon of the flanges and *a*, *b* and *c* are measured, the diameter *D* of the nipple can be found by: $D = c - (a + b)$.



The diameter of the nipple can be found by either of the methods illustrated. They are very simple and no knowledge of trigonometry is required

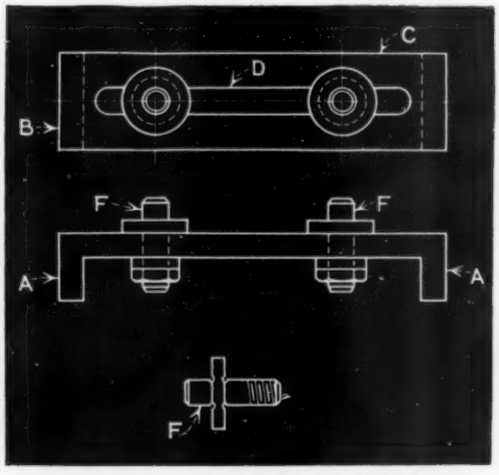
Gage for Checking Center Distance of Holes

GEORGE J. BELBES

John E. Hyler's gage (*AM*—Vol. 81, page 455) will undoubtedly do the work, but its use will be limited because its range of adaptability depends upon the number of gaging pins that may or can be set upon it. The usefulness of such a gage can be greatly extended if it is made as seen in the accompanying illustration.

The body is made from a bar of square or rectangular steel being cut away as shown to leave the two feet *A*. Surfaces *B* and *C* are machined at right angles to each other to facilitate setting up. Slot *D* is at a right angle to and parallel with surfaces *B* and *C* respectively, and is of such width as to admit the gaging pins *F* snugly.

With the gage so constructed, the gaging pins can be set at any center distance within its range. It will readily be seen that a series of gaging pins of different diameters and having threaded ends of the same diameter will be interchangeable in the slot and will permit a wide range of adaptability. More elaborate gages can be designed for doing the work with precision and rapidity, but their cost will be far greater than that of the gage described, the value of which lies in its simplicity, wide range of use and low cost.



The gaging pins can be adjusted for center distance in a lengthwise slot in the body of the gage, and are clamped by nuts from below

Removing Chips From Blind Holes

W. E. WARNER
Sompting, Sussex, England

Referring to the article under the above title by John E. Hyler (*AM*—Vol. 81, page 700), I have found a magnetized steel knitting needle to be effective for removing iron and steel chips from blind holes.

Compressed air is usually effective, but in blind holes there is a risk of the chips being blown to the bottom from where they can be removed only with difficulty. But suction cleaning is by far the best method. It can be done with a machine working on the principle of the vacuum cleaner, fitted with suitable nozzles. A small, portable suction machine will be found to be of great utility. Its advantage is that the chips are caught and retained in a receptacle attached to the machine, and not blown everywhere, as with compressed air. The value of keeping chips out of bearings and electrical apparatus is not often realized.

Casting Aluminum Bars

C. A. MOWREY
DuMaurier Company

We use a great many short aluminum bars of special diameters, but not enough of any one size to pay for the extra cost of having them rolled at the mill. We tried castings made in sand molds, but they were often so full of sand holes that we could not use them.

Now we melt clean aluminum scrap and pour it into seamless steel tubing of the proper inside diameter. When cold the castings will practically drop out when the tubes are lifted up, due to the greater shrinkage of aluminum. The cast bars are 7 in. long, but we believe that longer ones can be cast successfully.

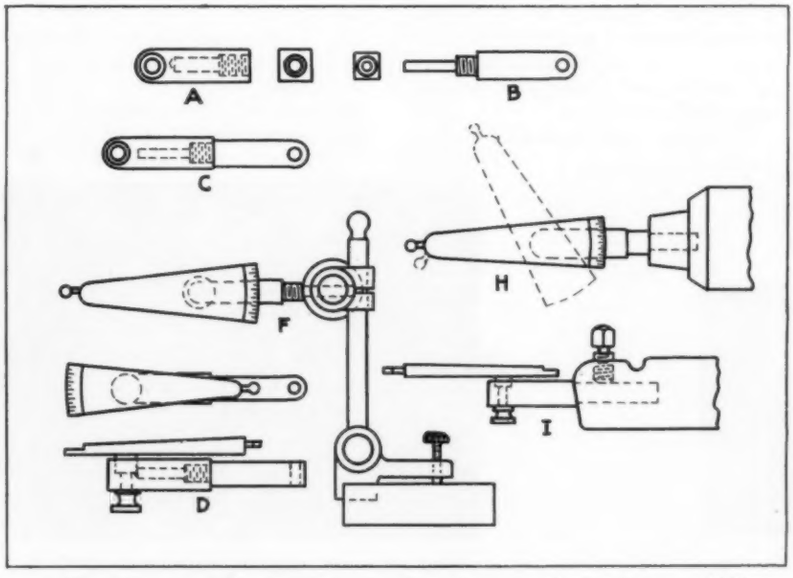
No special preparations are necessary for casting the bars. The smoother the insides of the tubes, the better will be the finish of the castings and the easier they will drop out. Out of several hundred pounds of castings only two had to be pressed out of the tubes, and that was because the insides of the tubes were badly pitted.

Adapter for the Shank of an Ideal Indicator

THEODORE KRUGER

An adapter for the shank of an Ideal indicator is illustrated herewith It is made in two parts, *A* and *B*, which can be assembled by screwing them together, as at *C*. Part *B*, separately, or the assembled adapter can be used for holding the indicator in different tools. Assembled, it can be folded to the back of the indicator, as at *D*, ready to be put in the toolchest.

Part *B* can be used for attaching the indicator to the surface gage in place of the scriber, as at *F*. It can also be used for holding the indicator in the drill chuck, as at *H*. Assembled, it can be used for holding the indicator in the toolholder, as at *I*, in place of the toolbit. Transferring the indicator to either end of the assembled adapter makes it adaptable to toolholders or boring bars having either $\frac{5}{16}$ or $\frac{3}{8}$-in. square holes.

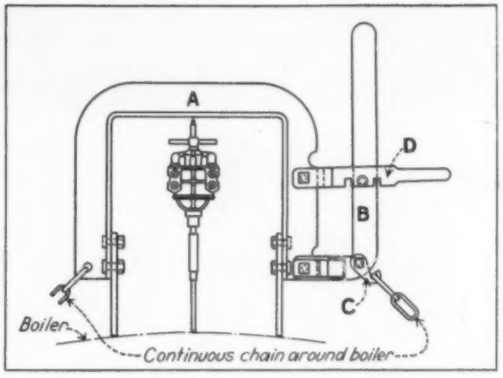


The adapter is made in two parts. Part B, separately, or the assembled adapter can be used for holding the indicator in different tools

An "Old Man" for Drilling Boilers

FRANK C. HUDSON

A type of "old man," designed especially for use with an air tool in drilling holes in boilers, has been developed by the Chesapeake & Ohio Railway Company. It consists of a frame of T-section as at *A*, with adjustable extensions on each leg to vary the depth of the opening from 17 to 21½ in. At the lower end of one side of the main frame is the bellcrank lever *B* with the small hook *C* on which any link of the chain around the boiler can be placed. The chain is of ¼ in. rod and 30 ft. long.



Several holes can be drilled in the boiler before this "old man" need be reset

With the chain around the boiler and lever *B* at its lowest point, the nearest link is put in the hook. Raising the lever tightens the chain, which is held by dropping the lever *D* on the nearest pin in *B*. This design of "old man" allows for several positions of the drill without resetting. It can be easily modified for other applications.

A Home-Made Speed Reducer

GEORGE H. COOPER

The speed reducer described by Frank C. Hudson (*AM*—Vol. 81, page 619) is an illustration of what occurs in places where the management is not farsighted enough to purchase a speed reducer to fit the requirements. The actual time involved plus the overhead and the value of the motor, if properly figured, will probably demonstrate the advantage of purchasing modern equipment.

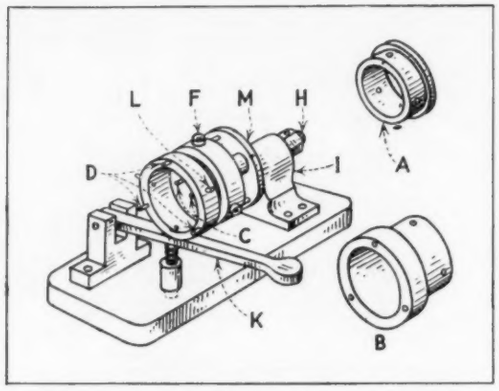
A new speed reducer would have ball or roller bearings, silent gears running in lubricant and completely guarded. The machine described by Mr. Hudson is a dangerous hazard, and its use should be forbidden until it has been adequately and completely protected by permanent guards.

Indexing Drill Jig

CHARLES H. WILLEY
Superintendent of Manufacturing
Hoyt Electrical Instrument Works

Sometimes the ideas of jig and fixture makers, even though they may not be approved as standards by the big shops, are of interest to others because there is generally something new in them.

One of our men designed the indexing drill jig illustrated for drilling three holes in the peripheries of



The parts are located by pins engaging holes made in molding. Index pins in the rotating member engage a hole in the spring-actuated index lever

the Bakelite bases and cases of one type of our meters. The base *A* is assembled to the case *B* by placing the base in the jig first, locating it on the pins *C*, and then putting in the case and locating it on the pins *D* in the face of the jig. The parts are a snug fit in the jig and require no clamping. The holes for the locating pins in both parts are made when they are molded.

With both parts in the jig, three equally spaced holes are drilled in their peripheries, using the guide bushings *F*. The rotating member is integral with the shaft *H* which has a bearing in the pedestal *I*. Lever *K* is spring-actuated and has a hole in which the hardened index pins *L* engage. After the parts have been drilled they are ejected by pins in the sliding disk *M* which is operated by hand.

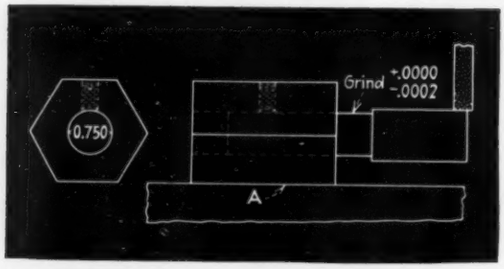
Grinding Hexagon Punches

GEORGE DES CHENES

In connection with two punch and die sets requiring close accuracy, we had to grind the sides of 24 hexagon punches. We used good oil-hardening steel for the punches, but owing to hardening growth varying from 0.0006 to 0.0008 in., which we found by tests, we deemed it advisable to leave an allowance of 0.004 to 0.006 in. on a side and to grind for correct clearances in the dies.

We then made the hexagon holder *A* of machine steel, not heat-treated but ground all over. The shanks of the punches were held in the ground hole in the holder and indexing was done by turning the holder on its faces. Obviously it took considerable time to grind the six hexagon faces of 24 punches precisely equidistant from the ground bore in the holder, but we were amply repaid by eliminating the necessity for indexing the punches while the shanks were held in a chuck, which would be rather risky in a case like this.

It was necessary only to take identical cuts on each hexagon face of the punches without disturbing the vertical setting of the abrasive wheel. About 0.001 in. was allowed for the final grinding.



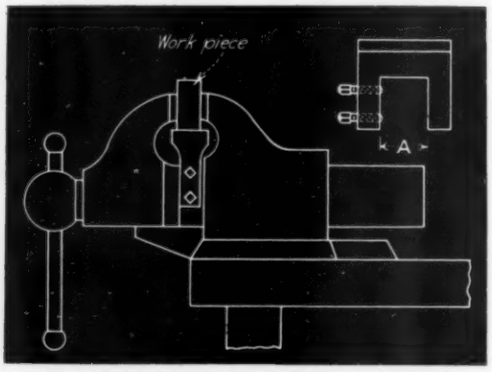
The shanks of the punches were held in the ground hole of the hexagon holder. Indexing was done by turning the holder on its hexagon

Support Anvil for the Bench Vise

PETER L. BUDWITZ

No doubt every machinist using a bench vise has had the experience of having the work slip in the jaws while subjecting it to heavy chipping or hammering. His first resort would be to place blocking of some kind between the work and the vise slide. After a few more cracks at the work the blocking would be jarred out and might fall on his toes.

A support anvil that will stay in place is shown in the illustration. It is made of machine steel and the opening *A* is machined to fit the vise slide. Two holes are drilled and tapped in one side for setscrews for attaching it to the slide. Its use will minimize marring the work by slippage and will reduce wear of the jaw faces to a great extent. Also, it will save the time lost in resetting the work in the vise after each slippage, and will also aid in setting the work level to begin with.



With this anvil support attached to the vise slide, heavy chipping and hammering will not cause the work to slip in the jaws

Indexing the Diamond for Dressing Abrasive Wheels

PETER VEIT
Foreman, Washington Iron Works

In using a diamond for dressing abrasive wheels, we give it a partial turn at each dressing so as to bring new and sharp cutting faces to the wheel. With an expensive tool like a diamond, it is best not to do this in a haphazard manner.

The shank of the diamond setting is turned down and one of the cutters of a Huntington dresser having every other tooth broken out is pressed on it. Since the cutter had originally eighteen teeth it now has nine. The reason for breaking out every other tooth is to leave space enough between the teeth for a finger hold in turning the setting. A number is stamped on the setting opposite each tooth, the numbers running from 1 to 9 inclusive.

In use, the diamond holder is set at about 30 deg. and the setting is indexed to every other number each time the wheel is dressed. Starting at 1, the indexings are, 3, 5, 7, 9, 2, 4, 6, 8, 1, thus bringing the diamond back to the starting point and bringing the same face to the wheel but once in two revolutions. Obviously, with 4½ indexings per full turn of the setting, a good sharp face of the diamond will be presented to the abrasive wheel at each indexing.

AMERICAN MACHINIST *Reference Book Sheet*

Atmospheres for High-Speed Steels

HEAT-TREATMENT of tungsten and molybdenum high-speed steels usually involves a protective atmosphere in the furnace chamber in order to prevent scaling or pitting. When a fuel gas is burned and the products of combustion are used to protect the steel, it is necessary to know what these products of combustion are, and what the effect will be on the steel when the proportions of the constituents are varied. At different gas-air ratios the percentages of the different flue gases present vary. One of the accompanying charts is based on a temperature of 2,200 F., which is the hardening temperature for molybdenum high-speed steel. The other chart is based on 2,350 F., which is the hardening temperature for tungsten high-speed steel.

With conventional furnace firing, the relations of the gases in the protective atmosphere is shown in Fig. 1. This chart was plotted for a temperature of 2,200 F. when using 530 B.t.u. gas of the following composition: CO_2—0.9 per cent; luminants—2.5 per cent; O_2—0.6 per cent; CO—8.8 per cent; methanes ($CH_4 + C_2H_6$)—25.5 per cent; H_2—47.7 per cent and nitrogen—14 per cent. This is a city gas. If other city gases vary widely from this composition, a chart must be prepared for them. Other fuels, such as natural gas and propane, require their own charts.

In Fig. 1, only the portions of the curves above the horizontal line represent conditions where temperature is maintained by combustion. Electric energy had to be added to extend the curves below the horizontal line. This line intersects the CO curve at 11½ per cent and the CO_2 curve at 4½ per cent. Lower CO_2 is obtained with luminous-flame combustion. For this condition the dash-line curves in Fig. 1 are used.

An air to gas ratio should be chosen such that low CO_2 and high CO are obtained. These conditions will prevent scaling. Similarly, a low ratio of $CH_4 + C_2H_6$ to hydrogen is desirable because it prevents a carbonizing effect on the steel. With luminous-flame combustion, use a 1½ air to 1 gas ratio, giving 10 per cent CO and 3 per cent CO_2, when hardening molybdenum high-speed steel.

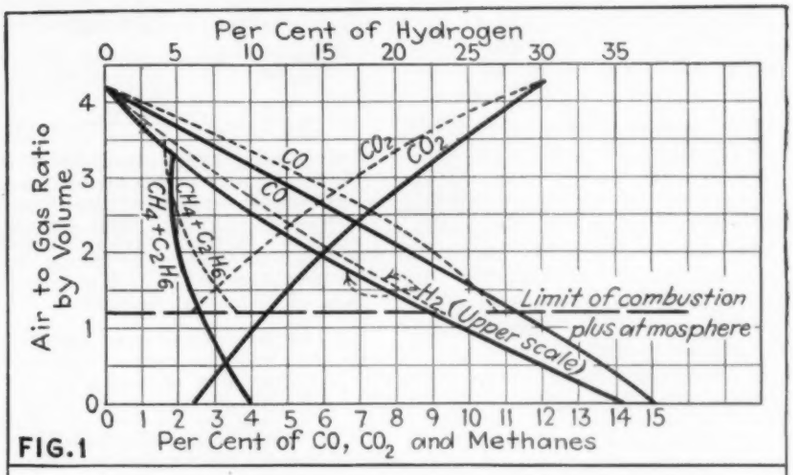

Per Cent of Hydrogen
0 5 10 15 20 25 30 35
Air to Gas Ratio by Volume
0 1 2 3 4
CO
CO2
CO2
CO
CH4+C2H6
CH4+C2H6
H2 (Upper scale)
Limit of combustion plus atmosphere
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Per Cent of CO, CO2 and Methanes

FIG. 1

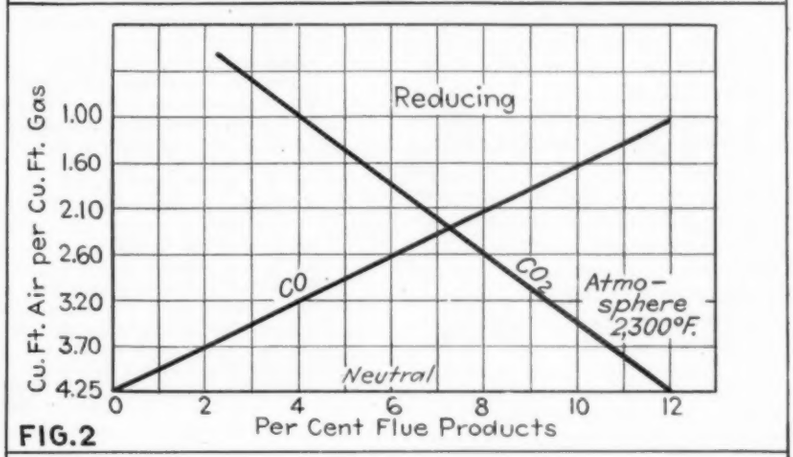


FIG. 2

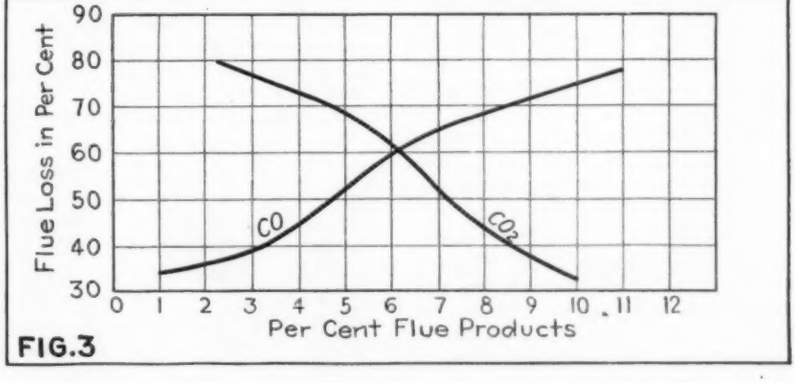


FIG. 3

Fig. 2 may be used to approximate air to gas ratios for luminous-flame practice. If the Orsat gas analyzer reading is 8 per cent CO_2 and 6 per cent CO, the air-to-gas ratio is 2.60 cu. ft. of air to 1 cu. ft. of gas.

Fig. 3 shows the flue loss that may be expected with CO atmospheres, whether conventional or luminous-flame practice, at temperatures around 2,200 F.

These data are published through the courtesy of B. K. Walpole and M. R. Utley of the National Gas Furnace Company.

Detroit Voters Defeat C.I.O.

BURNHAM FINNEY
Editor, American Machinist

THE SMASHING defeat of the C.I.O. candidates for mayor and council in Detroit on Nov. 2 climaxed the attempt of the United Automobile Workers to take over the city government there. It abruptly terminated for the present the threat of the C.I.O. as expressed by its candidate for mayor Patrick H. O'Brien, "Labor must seize the reins of government in the city of Detroit and in every other large city in the country."

Direct Action Tried

Detroit's municipal campaign provides an amazing story of how John L. Lewis tried to take over the government of the automotive capital, bag and baggage. There was no subterfuge, such as endorsement of candidates already in the race, but direct action. The U.A.W. entered its own leaders in the councilmanic contest. The candidates were Richard Frankensteen, assistant president and leader of the Ford unionization drive; Maurice Sugar, long a prominent radical and the U.A.W.'s chief counsel; R. J. Thomas, president of the Chrysler local and in charge of organizational work in all Chrysler plants; Walter P. Reuther, leader in the Detroit West Side local and frequently attacked by President Homer Martin of the U.A.W. because of his Red proclivities, and Tracy M. Doll, president of the Hudson local.

Mr. O'Brien is an old-time Detroit politician and office-holder who went into the position as attorney-general of Michigan on President Roosevelt's coattails in 1932. Said Mr. Martin during the campaign, "Mr. O'Brien is on the ticket entered by labor and not merely endorsed by it."

C.I.O. Boss Lewis put plenty of pressure on his lieutenants to do a bang-up job in Detroit. He sent from Washington Cecil Owens, veteran newspaper man, to handle publicity. The U.A.W. created a political action committee which set up a city-wide organization to get out the vote for the labor ticket. The city was divided into 16 districts; within each district were ward and precinct captains plus hundreds of volunteers enrolling under their leadership. Everything was done to give the impression that the C.I.O. ticket had Mr. Roosevelt's blessing. Chanted Mr. O'Brien, "The forces which make for an abundant life are on my side." From billboards around town was flung the challenge to the voters, "Choose the economic royalists or the people."

C.I.O. candidates made impossible promises. Because it had ejected sitdown strikers from several plants last spring, the police department was a special target for the candidates to shoot at. Shouted the C.I.O.: "The city crouches under dictator, strike-breaking police. We demand the protection of the right to organize, strike, picket and bargain collectively, with no strike-breaking and no evictions." Police Commissioner Heinrich Pickert would have been the first to be ousted if the C.I.O. had won.

What outraged Detroiters more than anything else about the campaign was the flagrant attempt to substitute class rule for a non-partisan form of government which had prevailed for the past 20 years. Since 1916 Detroit has not been ruled by Republicans or Democrats, but has maintained a government ranking with Cincinnati at the top of the list of politics-free cities. Among front-rank supporters of this government has been the Detroit Citizens League consisting of 3000 citizens representing every class and type. Before the election the league militantly took a stand as follows:

"The one issue in this election has been made clear by leading candidates before and since the primary: Shall Detroit retain its popular democracy or substitute therefor a labor dictatorship?"

C.I.O. Turned Back

The voters answered in no uncertain terms on Nov. 2 when Mr. O'Brien was swamped by Richard Reading for the mayor's job and when not a single one of the C.I.O.'s five councilmanic candidates was elected to the nine vacant posts. However, this successful resistance to labor domination was accomplished only by the alertness of the citizenry who realized that a C.I.O. victory would let them in for plenty of grief. Not the least of the worries would have been a complete upsetting of Detroit's refinancing program, which would have been costly to taxpayers.

Detroit has been able to reestablish its credit slowly since the depression because of a program of strict economy and of collection of delinquent taxes. However, since the General Motors strike and the wave of sitdown strikes which followed early this year, Detroit bonds have declined more than 15 points or twice the loss suffered by bonds of any other of the 13 largest municipal governments in the country.

The political action committee of the U. A. W. conducted a contest among members for the best campaign song in connection with the Detroit municipal election. Brother Leonard E. Kluk, president of local 238 of Detroit, won the first prize of $25. His song to the tune of "Solidarity" follows:

All the workers stand united
We have just begun to fight
We are tired of being slighted
We will demonstrate our might
We will cast our votes united and
defend the workers' rights
For the union makes us strong.
Refrain: Solidarity forever, etc.

Make way for union labor
For we're on the march this fall
We will leave the slums behind us
And we'll storm the city hall
There is nothing that can stop us
And we have no fear at all
For the union makes us strong.
Refrain: Solidarity forever, etc.

We'll stop the vigilantes
We'll put Pickert* in his place
We will build more decent houses
Of our slums we'll leave no trace
We will lead the fight for justice
For the world we'll set the pace
For our union makes us strong.
Refrain: Solidarity forever, etc.

---

* Heinrich Pickert is Detroit's police commissioner.

INDUSTRIAL REVIEW

IF THE MACHINERY and machine tool industries had to live on domestic business for the rest of this year their pickings would be rather slim. Many manufacturers of equipment have profited from foreign orders which they have been able to book partly because the drying up of domestic business has permitted them to quote reasonable deliveries. Many buying programs that had been expected to close this year have now been put off until 1938 so that buyers can see what Congress does before they place orders.

NEW ENGLAND distributors expect very little in the way of orders until after the first of the year. In the Metropolitan District one or two companies have gone ahead with programs that had been planned earier in the year. Otherwise the situation is very quiet. Philadelphia does not expect anything of the rest of November and all of December, but is hopeful that Congressional action will loosen things up for the first quarter of 1938. Specialties and heavy equipment are doing fairly well in the Pittsburgh territory but business in standard equipment is at a standstill.

CLEVELAND expects nothing but poor business for the rest of the year although inquiries are fair and occasional orders are being placed. Detroit is decidedly pessimistic about the next six weeks because hold-ups and cancellations are beginning to come in. Inquiry has also been active in Toledo but actual buying is practically nil. In Indianapolis both inquiries and orders are coming in at a fair rate and local manufacturers do not seem to be particularly worried. Business is still quiet in St. Louis but local opinion is to the effect that better times are ahead if Congress acts constructively.

CINCINNATI is not looking for any improvement before January but local machine tool builders have been favored by good foreign orders. Chicago distributors expect business to continue at about the October level which was the lowest for this year. Plenty of business is pending but closing is becoming more difficult. New business is still dropping in Milwaukee and there is not much hope of a reversal until Congress acts.

WESTERNERS continue to look east and to Washington for the next cue on future business. There are no influences apparent to indicate that machine tool orders will swing upward before the year's end. Most business men seem to be taking the long view at 1938, are considering the year as a whole, feel that it may be better on the Pacific Coast than 1937.

CHIPS

Washington

House Ways and Means Committee puts undistributed profits tax at the top of the list for attention . . . Social Security Board would permit workers to accumulate pension funds after 65, include seamen under law. . . . Secretary Swanson voices fears that restrictions such as the Walsh-Healey Act will spoil navy building program . . . Chamber of Commerce of U. S. urges Roosevelt to listen to his moderate advisers and aid business . . . Chairman Harrison of Senate Finance Committee indorses Secretary Morgenthau's plea for economy and tax revision . . . Roosevelt planning to stimulate private building . . . Special Session of Congress opens with instructions to pass farm, wage-and-hour, 7 T.V.A., and governmental reorganization measures.

Foreign

British minister says that he is trying hard for trade agreement with U. S. but there are lots of snags . . . Eden suggests Italy give up some colonies to Germany, Mussolini doesn't think much of the suggestion, and says so. . . . U. S. declines Cuban bid to join in Spanish mediation, non-intervention conferrees get nowhere fast in their efforts to oust "volunteers" . . . Japan considers declaration of war against China despite complications that would ensue, and danger of having U. S. neutrality law invoked to stop shipments of munitions and materials to belligerents . . . Soviets try 13 conspirators who tried twice to liquidate Stalin . . . Rumor denied that Hitler may try to mediate between Japan and China . . . Japan's best troops massed on Siberian border, Shanghai falls . . . Mexico nationalizes 350,000 acres of oil land leased to Standard of California . . . Duke of Windsor postpones trip to U. S. to study industry and housing because of blast of criticism from A.F.L. . . . Italy joins German-Japanese anti-Communism agreement . . . Russia celebrates twentieth anniversary of revolution with radio gatherings . . . Brazilian president sets up nationalistic state which is hailed in Berlin as Fascist but which he denies is other than a special form of democracy . . . Great Britain will take over coal industry in 1942.

Finance

More gold leaves U. S. for Europe than arrives from the Far East . . . Hint of friendlier policy toward utilities causes stock market rise.

Industry

Remington-Rand puts on third shift to make electric razors . . . A.F.L. and C.I.O. renew peace parleys and make about as much headway as the Non-Intervention Committee on Spain . . . Motor truckers will join railroads in demand for 15 per cent freight rate increase . . . Six New England governors meet to devise a defense system against campaign of Southern states to attract industrial plants . . . Best W.P.A. workers are 47 years old, says Secretary Perkins. . . . A.F.L. joins New York Edison in vigorous attack on N.L.R.B. for its ruling voiding labor contract between the two . . . A.F.L. drafting amendments to Labor Relations Act.

Indicators

Steel production recedes further to about 40 per cent . . . Electric power output decline more than seasonal. . . . *Business Week's* index steady at 68.2.

J. M. Fernald Heads Refrigerating Group

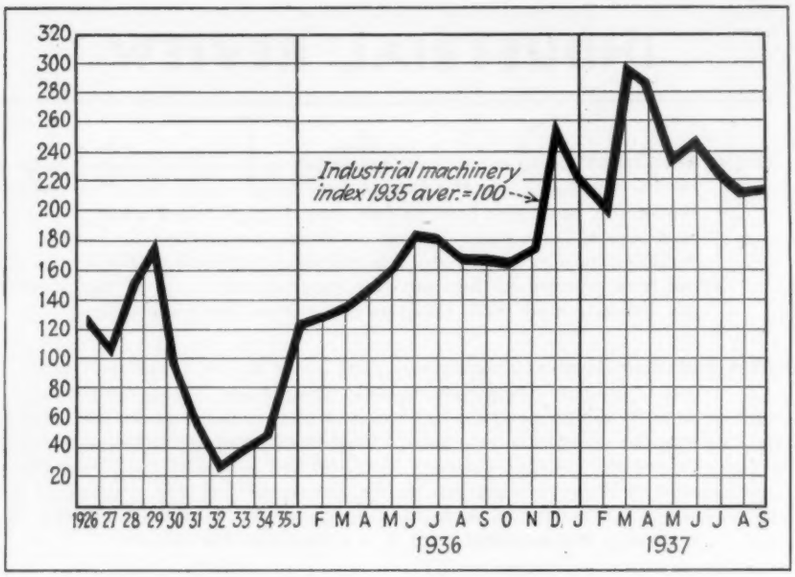
J. M. Fernald, vice-president and general manager of the Baker Ice Machine Co., was re-elected president of the Refrigerating Machinery Association at its recent meeting in Chicago. S. E. Lauer, vice-president, York Ice Machinery Corp., was re-appointed chairman of the standards committee. A. H. Baer, general sales manager of the Carbondale Div., Worthington Pump & Machinery Corp., was re-elected first vice-president. William B. Henderson, of Washington, D. C., was re-engaged as executive vice-president.

N.A.M. to Give Extra Day to Labor Relations

By adding a day to its annual meeting, the National Association of Manufacturers will give its members an opportunity to discuss labor relations and to hear expert opinions on the subject from outsiders. General Hugh S. Johnson will speak on "Wages and Hours" and Dr. Leo Wolman on "Modern Pattern of Labor Organizations and Outlook for the Future." There will also be a 1½-hour session of questions and answers on the application of the Wagner Act. Dorothy Thompson, journalist, will be one of the feature speakers at the annual dinner on Thursday evening, December 9.

The annual meeting this year will be held as usual in conjunction with that of the National Industrial Council. The Council will begin its two-day session on Sunday, December 5, at the Waldorf-Astoria Hotel in New York City. Sessions of the N.A.M. will occupy the last three days of the Congress of American Industry, December 7, 8 and 9.

A complete survey of good business practices and ethics will be reported before the Congress by H. W. Prentis, Jr., president of the Armstrong Cork Co. The report covers relationships with customers, suppliers, competitors, employees, stockholders, creditors, the local community, and government. Manufacturers associations will study the report before its submission to the Congress.

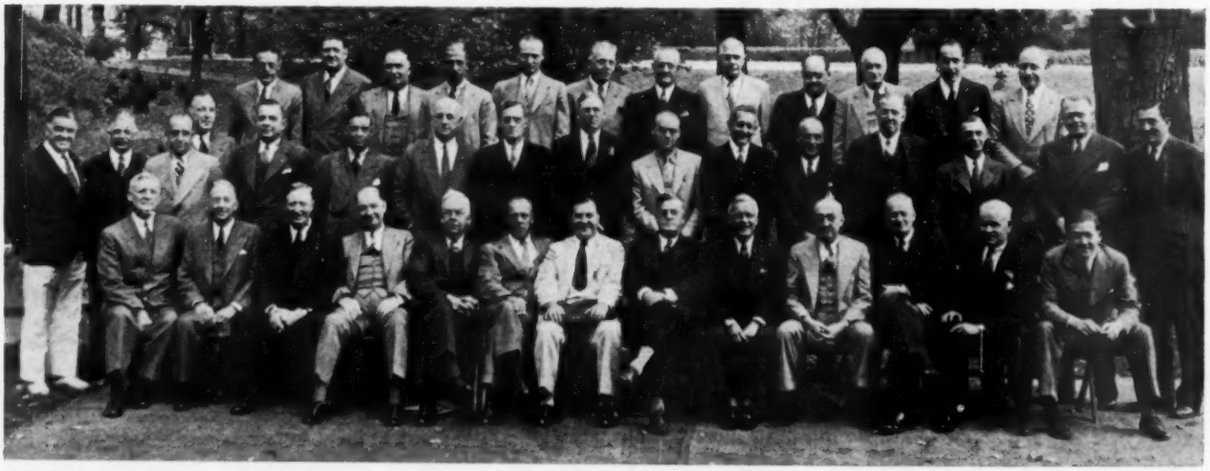


Machinery Index Stationary

Final figures for September placed the American Machinist Index of Industrial Machinery Orders a fraction of a point above the August level—215.6 as against 215. While this was not much of a gain it did represent a pause, at least, in the down swing that had persisted since March.

Engineering Trustees Elect D. Robert Yarnall

D. Robert Yarnall, chief engineer of the Yarnall-Waring Co., has been elected president of the United Engineering Trustees, joint agency of the four Founder societies of civil, mining and metallurgical, mechanical and electrical engineers. Mr. Yarnall, Henry A. Lardner of the J. G. White Engineering Corp., and Kenneth H. Condit, editor, *American Machinist*, represent the American Society of Mechanical Engineers as trustees.



Machine Tool Dealers at French Lick Springs—Retiring president Harry Barney of Pittsburgh sits in the middle of the first row with a portfolio on his knees. A. G. Bryant of Chicago, president-elect, is third from the right on the front row

DETROIT LETTER

Car Production Curtailed As Dealers Are Stocked and Sales Dip . . . Major Selling Effort Postponed Until Spring . . . Price Reductions Not Expected . . . G.M. Diesel Output Delayed . . . Labor Outlook Better

DETROIT—Though the 1938 car season got off to a good production and sales start during October, when measured by the industry's performance a year ago, news from the factories the remainder of this year won't be so pleasant. It is a bit disconcerting to see output beginning to dip after little more than a single month's assemblies of new models, yet car makers face that situation.

It isn't hard to find an explanation. Change-overs this fall were made more quickly than ever before, hence factory operations soared to a high point in record time. New cars came off assembly lines so rapidly that dealers were fairly well stocked by Nov. 1. Since the public hasn't leaped at the opportunity to buy '38 models, it has been necessary in numerous cases to reduce production. It appears likely that the lull in manufacture will continue for 90 days or more, with plants failing to snap back into higher production until early spring.

Poor Show Attendance

Most of the local automobile shows, including the New York show, were poorly patronized compared with last year. Chicago was a shining exception. This fact has brought forth the biting criticism in automotive circles that the shows were pretty flat because they lacked showmanship and that the Chicago show was "hot" because it was a real show. Before the season is ended it may be that car makers who were content to let well enough alone in switching from '37 to '38 models will wish that they had been more enterprising. Companies which have made major changes—Buick, Packard, Graham—are still far behind on dealers' orders, in contrast with other companies.

With the situation what it is, the industry has revised its plans for the winter. The larger producers are figuring on postponing major selling efforts until spring. Such indicators of forthcoming production schedules as steel releases don't point to the fact that the industry will try to force the market for cars. Moreover, rumors of price reductions are mostly dismissed as being without foundation. A flurry was caused last week by the erroneous report that Plymouth had cut its de luxe models $15, but the management hurriedly corrected the misconception. The truth is that car companies believe that little if anything would be gained by slashing prices. Costs are too high to permit much of a reduction and a decrease which would be little more than a gesture wouldn't yield any extra business. If any company seriously contemplates a move to lower prices, it won't act until the retail market has been much more thoroughly tested than it has been the past few weeks.

Labor Threat Diminishes

With Detroit voters having filled the election boxes with anti-C.I.O. ballots and with car production and sales showing signs of anemia, the threat of serious labor difficulties the coming winter isn't so great as it was 30 days ago. While the industry is endeavoring to maintain production rates as high as is feasible without overstocking dealers and warehouses, most car makers would not feel too badly if they had to shut down temporarily. Management is in no mood to tolerate trouble right now and would close factories instantly if a strike was started in only one department. That is what happened one day last week at the Hudson plant.

Progress toward a new agreement between the United Automobile Workers and General Motors is reported. Meanwhile, contrary to a general impression, the old agreement signed last February continues in force. In fact, it cannot be terminated except by written notice served by one side on the other and neither side has yet chosen to take that step. The trend in U.A.W. strength is mixed, with a decline in some plants and good maintenance of interest in others.

Production of smaller diesel engines by General Motors in its new Detroit plant probably won't begin until spring. A major factor in delaying the start of operations is inability to obtain machine tool deliveries on relatively short notice. Further improvements may be made in the design of the G.M. diesels before they go into production, as a result of extended service operation tests now being conducted in various parts of the country.

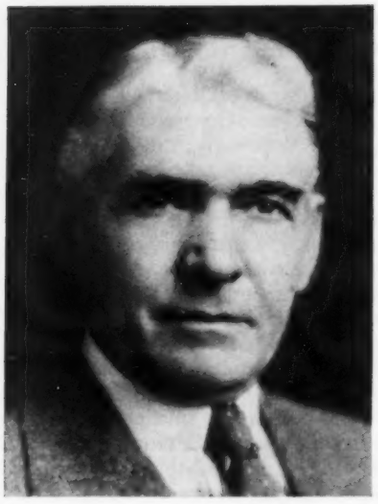
Tool and die shops in the Detroit district are still expecting earlier-than-usual orders in connection with 1939 models, possibly in December. To date, however, no actual releases of importance have been made. It would not be surprising if the industry should plan even more extensive changes for '39 than already are anticipated. This will be true if car manufacturers continue to have a time selling their current lines. If such plans materialize, there will be a mad scramble on tool and die programs in spring and early summer, since any decision to make important changes will inevitably be accompanied by efforts to introduce '39 models as early as possible.

Smaller Cars Watched

With a recession in sales having developed, the Big Three are believed to be scrutinizing more closely the field occupied by Willys-Overland. If a new depression should make car purchasers more wary about spending their money and economy should be a paramount selling point, Willys ought to make a clean-up in sales the coming year. Should Willys so profit, one or more of the big fellows won't indefinitely permit the Toledo outfit to go along without competition.

Machine tool buying, now in an in-between-season period, is light. Ford's program to expand plant capacity has resulted in few orders as yet, but bids still are being asked on many additional items from day to day.

Athel Denham, head of Denham & Co., and formerly chief of the Detroit editorial staff of the Class Journal Co., is now representing *American Machinist* editorially in Detroit. He replaces Burnham Finney, who was recently promoted to the rank of editor and transferred to the New York office. Mr. Denham, who was graduated as a mechanical engineer by Stevens Institute of Technology, brings to his new connection familiarity with the automotive field and wide acquaintanceship with its executives.



A. T. HATCH

A. T. Hatch Elected by Davenport Machine Co.

Because of the recent death of William S. Davenport, president and general manager of the Davenport Machine Tool Corp., and the resignation of Edith E. Davenport, director, because of ill health, new officers and directors have been elected. A. T. Hatch, secretary-treasurer of the company since its incorporation in 1919, became president and general manager to succeed Mr. Davenport. Clayton R. Burt, an original incorporator, and also president of the Niles-Bement-Pond Co., continues as vice-president and chairman of the board.

C. W. McKay, second vice-president and one of the original incorporators, continues as legal advisor. R. M. Whitney, auditor, succeeds Mr. Hatch as secretary-treasurer. Two new directors were appointed to fill vacancies. They are: F. G. Silva, shop superintendent and E. W. Brinkman, who has been responsible for the machine operating and sales engineering divisions of the company.

Parts Association Will Meet in Chicago

Manufacturers and wholesalers of automotive parts will hold a convention and show at the Sherman Hotel, Chicago, from Dec. 2–11. Nov. 29, 30 and Dec. 1 will be pre-convention days during which finance and research committees, and boards of governors for the two divisions, will meet. The convention, itself, will get under way on Dec. 2 with the first general session, and the second and third general sessions will occur on the following day. The show will be staged at the Navy Pier and will run from Dec. 6–11. It is open only to associations sponsoring this affair.

Labor Attack Causes Windsor Trip Delay

The Baltimore branch of the American Federation of Labor effectively used the old trick of attacking persons prominent in the news to secure publicity. Charles Bedaux, directly, and the Duke of Windsor, indirectly, were the objects of a blast which resulted in deferring the U. S. tour of the ex-King and his American bride.

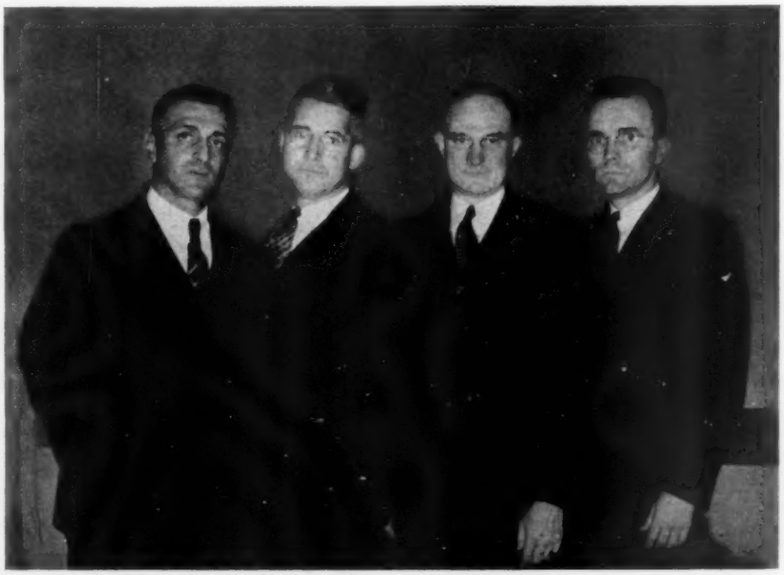
The entire criticism was based on the rather flimsy pretext that Mr. Bedaux headed a concern antagonistic to industrial labor; his activities were branded by the approbrious term "stretch-out." In the metal-working industry, at least, the only labor that had anything to fear from Mr. Bedaux' work is the element that is entirely opposed to any attempt at measuring a fair day's work. The Bedaux system consists essentially of a measurement of production together with an incentive plan by means of which the better-than-average worker could increase his earnings. It is only one of many methods used by management to place a premium on skill. Talk of the imposition of inhuman tasks is purely a play for publicity.

A.S.T.E. Charters New Chapter at Newark Meeting

C. Frank Sheely, supervisor of tool design, Hyatt Roller Bearing Co., was unanimously elected chairman of the Metropolitan New York and Northern New Jersey Chapter of the American Society of Tool Engineers at an organization meeting held November 1 in Newark, N. J. Ford R. Lamb, executive secretary, and Frank R. Crone, national treasurer of the society, met with approximately 120 interested production and design executives, tool designers and others to discuss the history and purposes of the organization.

Officers and members of other chapters present at this meeting included: Nils H. Lou, Glenn L. Martin Co., Baltimore Chapter; Ben A. Page, time study supervisor, Bullard Co., Bridgeport Chapter; and Fritz Mitschke, Hartford Chapter. Conrad O. Hersam of the Industrial Consulting Co. was in the group, and told of his present activities in connection with the proposed organization of a chapter in Philadelphia.

Other officers of the new chapter include: Herbert D. Hall, Vandyck-Churchill Co., vice-chairman; Remo Rege, manager, production engineering dept., Wright Aeronautical Corp., treasurer; and Ben C. Brosheer, assistant editor, *American Machinist*, secretary. "Modern Time Study" will be discussed by Fred W. Shumard at the December 14 meeting, which will be held in Newark, N. J.



Chapter No. 14 of A.S.T.E. Organized—**Officers elected at first meeting of the new chapter were (left to right): Remo Rege, treasurer; H. D. Hall, vice-chairman; C. F. Sheely, chairman, and Ben C. Brosheer, secretary.**

WATCHING WASHINGTON

Special session activity to be modified by business recession . . . Administration overtures to industry already in evidence . . . Utilities offered peace at a price . . . Surplus and capital gains taxes due for revision . . . Morgenthau calls for cut in spending

WASHINGTON—Congress has convened in a chastened mood—chastened because most of its members will have to stand for reelection during a year when business indexes may point downward instead of upward. Well they know of the adverse political results of a downswing in the business cycle.

The Administration knows this, too, and has already tipped its hand to some of the steps whereby it will seek to rebuild confidence in private enterprise. It has learned that it cannot finance its reform program at the expense of private profits while taking every opportunity to criticize the structure which make these profits possible. No one wants a continued recession; but a recession at this time may have a salubrious effect on immediate legislation and in the long run make for the betterment of conditions under which industry must function.

Trying to Be Nice

Among the conciliatory measures already indicated are: a more equitable tax program; reduction of government expenditures to balance the budget; terms of peace for public utilities; stimulation of private enterprise in building; a ship subsidy; and a more liberal policy toward private credit. This is not a complete list of the things industry needs to restore confidence. There should be in addition a willingness on the part of government to oppose extreme monopolistic tendencies in labor organizations and some cognizance of the fact that excessive advances in labor costs have retarded a revival of the construction industries.

The overture toward the utilities is important chiefly because it indicates that the Administration is not completely opposed to the theory of private ownership as might be suspected from the political erosion to which this industry has been subjected during the past five years.

The tax program is likely to get a more thorough going over than seemed possible a few months ago. It is not going to be difficult to convince members of Ways and Means Committee that it is a mistake to penalize the purchase of new equipment and the expansion of industrial plants. Exemption from the undistributed earnings tax for such expenditures, within certain limits, is almost certain to be recommended. There is no thought of changing the whole principle of the bill at this time, however. Amendments that will relieve debt-ridden companies and those not in a strong financial position may meet approval. It is also possible that an exemption may be made so that a certain amount of reserve may be carried as a cushion against unprofitable years.

Easing of the capital gains tax has already been approved by the Ways and Means Committee in a proposal which would permit carryover of losses for one or two years. Another plan is to repeal this tax entirely and to substitute a levy on the interest income from tax exempt securities.

Secretary Morgenthau's call for a $700,000,000 cut in federal spending is the first concrete plan offered by an Administration official to balance the budget by curtailing spending. The plan presented at a New York meeting of the Academy of Political Science specifically pointed to the principal causes of high deficits, namely, public highways, public works, unemployment relief and agriculture.

In the opinion of members of the House Appropriations Committee, Administration estimates of the deficit for the next fiscal year are far too low. The budget provides for an increase in the Army and for various increases in other national defense items, but returning members of Congress feel that the United States should be better prepared at a time when the world situation is so unstable.

Belief in government economy as a cure for business is far from universal in New Deal circles. One group headed by Works Progress Administrator Harry Hopkins openly espouses the theory that spending should be uninterrupted.

Farm Bill First

Despite the anxiety regarding business activity, the two measures selected for first action by the Administration are not helpful to industry. The farm bill for a new agricultural subsidy must be financed either by general taxation or a special processing tax. One method would be directed chiefly against industry, the other chiefly against consumers: either would divert national income for the benefit of a single group.

The wage-hour bill, second on the list, may be moderated by the turn of events. Senator Berry's version would provide a 40-hour maximum work week and a 30- or 35-cent minimum wage. No administrative board would be appointed; the law would be enforced by the Department of Justice.

Success or failure of the attempt to prevent a continuation of the down spiral will depend a lot on business' appraisal of the Administration's sincerity. Another "breathing spell" for immediate political considerations will merely breed suspicion. Business must have definite evidence of the scrapping of many policies that have harassed it in the past few years.

MONEY FOR MUNITIONS

There will not be additional "billions" for the Army and Navy, reports of which were so rife within a week after President Roosevelt's Chicago speech, but there will be heavier appropriations than were conceivable when Congress adjourned. The preparedness budget was already large. Approval had already been given to a considerable increase in spending, so that it is only the additions to this which now are interesting. These will run into a good many millions, perhaps into a couple of hundred millions if airplanes are counted.

The most interesting phase of these additions will be educational orders. It will be easier to get money for educational orders from Congress than at any time in the past. Reason for this is that a substantial group, especially in the Senate, have come around to favor educational orders who in the past have been against any boost in preparedness expenditures. It includes Little Army men and Little Navy men. It also includes, and this is the most significant group, senators who on the Nye Committee have worked consistently for years to "take the profit out of war."—Carter Field, *Washington Bureau, McGraw-Hill Publishing Co.*

Machine Tools Drop

Machine tool orders have gone up the hill and down again since September, 1936. Now domestic business is little better than it was a year ago, and total business is better only because of strong foreign demand. The descent has been rapid since the peak in April, 1937. Foreign business is dropping off too, but is still at a relatively high level. It is likely to prove a cushion to absorb the ill effects of further domestic curtailment until business has had a chance to see how the wind blows in regard to taxes and monetary policies.

Index of Machine Tool Orders

Based on Volume of Shipments for 1926

Month	Index of Orders: Domestic	Index of Orders: Foreign	Index of Orders: Total	3 Months' Average Index	% Foreign to Total Orders
1936 — October	105.4	31.1	136.5	127.5	23
November	110.7	36.4	147.1	134.0	25
December	205.7	52.0	257.7	180.4	20
1937 — January	156.1	44.0	200.3	201.7	22
February	122.4	42.8	165.2	207.7	26
March	172.1	39.5	211.6	192.4	18
April	232.5	50.0	282.5	219.8	18
May	161.4	47.1	208.5	234.2	22
June	137.6	54.2	191.8	227.6	28
July	115.4	55.7	171.1	190.5	32
August	129.5	50.3	179.8	180.9	28
September	119.0	91.7	210.7	187.2	42
October	89.1	62.9	152.0	180.8	43

Distribution of Orders

Average Indexes of Individual Companies Based on 1926 Level of Business	Companies In Per Cent of Total Number Reporting: 1936 2nd Quar.	1936 3rd Quar.	1936 4th Quar.	1937 3rd Quar.	1937 Oct.
200–up	17.2	15.8	28.4	33.4	27.2
100–199	32.6	28.8	30.2	30.2	28.0
60– 99	19.0	22.9	19.5	15.7	19.1
20– 59	21.8	21.7	15.2	12.7	16.9
Less than 20%	9.7	10.8	6.7	8.0	8.8

Primary Machine Tools Still Imported by Japan

TOKYO—The measure providing for the import restriction or prohibition of some 500 items of the Customs Tariff, which went into effect on October 10, comes equally as a boon to Japan's machine tool industry, inasmuch as the ordinance restricts importation of items which are produced in volume within the country. It does not affect the importation of primary machine tools.

The total amount of machinery and tools production by the seven leading companies, which totalled 288,700,000 yen in 1936, is expected to reach at least 400-500 million yen at the end of this year. The increase will of course be partly accounted for by higher raw material prices and increased labor expenses.

Despite rigid exchange control, machine-tool imports into Japan are expected to reach 50 million yen during the current year. A notable trend in the import trade is the gradual shift from cutting to grinding and related tools, *Nippon Kogyo* says.

An unexpected problem has arisen in connection with the import business. Early in October American machine tool manufacturers advised Japanese importers not to trade through the Bank of Japan. Instead they asked the local traders to make a 30 or 40 per cent deposit through American bank guarantee or letter of credit, with all deliveries to be contracted for at factory.

With the invocation of the Neutrality Act still in sight, Japanese buyers are continuing business at the risk of losing their deposits in case deliveries become impossible.

The Tokyo plant of the Nakajima Aircraft Works has again started buying foreign and domestic machinery. In the imported makes, preference will be given to American products, the *Nippon Kogyo* learns. The Kawasaki Airplane Co., also launched on an extensive retooling program, is negotiating with German representatives. The Aircraft Division of the Mitsubishi Heavy Industries has asked European and American agents to present data.

Statistical data collected by Government questionnaires from machinery and hardware dealers' associations cast an interesting sidelight on the supply-demand situation in high-speed steels. The *present* demand is estimated at from 3,600 to 4,000 tons, and the supply situation as follows: imports, none; domestic production, 80-90 tons.

E. P. Bullard to Speak at A.S.M.E. Session

Guest speaker at the luncheon of the Machine Shop Practice Division, American Society of Mechanical Engineers, on Dec. 7 will be E. P. Bullard, president of the Bullard Co. This division is sponsoring a special session on plastics in connection with the annual meeting of the society, Dec. 5–9. Other topics that will be taken up are surface quality, maintenance of carbide-tipped drills, safety and dust. Highest honor bestowed by the society, the John Fritz gold medal, will go to Dr. Paul Dyer Merica, director of research, the International Nickel Co. An abstract of the tentative program follows:

Monday, December 6

6:00 p.m.
Motion-Study Dinner

6:00 p.m.

Motion-Study
Labor's Attitude Toward Time and Motion Study
Speakers: Glenn L. Gardner and Geo. S. Dierstein

Machine-Shop Practice
Profilometer for the Rapid Measurement of Surface Roughness, by E. J. Abbott
Maintenance of Cemented Carbide-Tipped Drills, by Malcolm Judkins

Tuesday, December 7

9:30 a.m.

Plastics—I
Plastics Materials, by Harry Burrell
Development in Molding Equipment, by L. F. Rahm

12:30 p.m.

Maintenance
Maintenance Lunch (Management Division)
Maintenance, Management, and Control, by William O. Lawson, A. E. Windle, and John I. Thompson

2:00 p.m.

Management
Decisions of the National Labor Relations Board, by J. Warren Madden

Plastics—II
Mechanical Design of Plastic Parts, by David M. Buchanan
Of Art in Plastics Design, by R. J. Hill

8:00 p.m.
Honors Night

Wednesday, December 8

9:30 a.m.

Management
Scientific Management in the Unionized Plant, by Harold D. Bergen and George W. Taylor

2:00 p.m.

Management
Scientific Management in the Unionized Plant—A Case History

6.30 p.m.
Annual Dinner, Hotel Astor

Thursday, December 9

9:30 a.m.

Management-Materials Handling

Importance of Materials Handling as a Conserver of Skilled Labor, by C. Keith Pivear

Safety

The Application of Safety in Mechanical Production, by Everett W. Martin

The Relation of an Adequate Job-Training Program to Accident Prevention, by Glenn L. Gardiner

2:00 p.m.

Apprenticeship Training

Apprentice Training, by Wm. F. Patterson

Machine-Shop Practice

What Constitutes a Safe Dust Level in Foundries, by Theodore F. Hatch

Safety in Machine Design, by A. W. Luce

Radiographic Inspection, by H. R. Isenburger

PERSONALS

C. PARKER HOLT, executive vice-president of Caterpillar Tractor Co., has relinquished the office to A. T. BROWN, formerly vice-president handling accounting, traffic, treasury and parts departments. Mr. Holt will return to the San Leandro, Calif., office, where he will direct all activities there. A vice-president is L. B. NEUMILLER, formerly director of industrial relations, who will now handle parts, service and traffic, as well as industrial relations.

F. S. ROBBINS, superintendent, motive power of the Atlantic Coast Line, has been appointed general superintendent, motive power, with headquarters as before at Wilmington, N. C. Mr. Robbine succeeds JAMES PAUL who retired November 1.

E. G. BAILEY, vice-president, Babcock & Wilcox Co., and president of the Bailey Meter Co., received the honorary degree of doctor of engineering from Lehigh University for "notable and distinguished accomplishments in the field of combustion and steam engineering."

GEORGE S. CASE, JR., has assumed the office of vice-president and general manager of the Lamson & Sessions Bolt Co., Birmingham. Mr. Case succeeds H. P. LADDS who resigned.

J. M. MCNEAL, European sales manager of the Landis Machine Co., is visiting the home office at Waynesboro, Pa. Mr. McNeal's headquarters are at Birmingham, England.

DAVID MAITLAND HARVEY has been appointed superintendent of the oil department, Philadelphia plant, E. F. Houghton & Company. Mr. Harvey will have the production of sulphonated oils, quenching oils, extreme pressure lubricants and other oils under his direction.

MILES C. SMITH, who has been in charge of sales and marketing for Colmonoy, Inc., Los Angeles, has joined the American Concrete & Steel Pipe Co.

ARTHUR MCCAUGHNA, formerly with Norge Refrigerator Co., and prior to that associated with Kelvinator Corp. and Edward G. Budd Mfg. Co., has been made president of General Foundry and Mfg. Co., to succeed Carl W. Bonbright.

FRANK J. TONE

FRANK J. TONE, president of the Carborundum Co. and recipient of many awards and medals, received the 1938 William H. Perkin medal of the Society of Chemical Industry for his "valuable work in the development of abrasives and refractories."

STEPHEN M. JENKS has been made assistant general superintendent of the Gary works, Carnegie-Illinois Steel Corp. EDWARD A. BROWN, JR., has been appointed assistant to the general superintendent, Dequesne works. LAURENCE S. DAHL, superintendent of the hot strip mills, Gary, has been appointed superintendent of the Irvin works.

Exports of Machinery During September, 1937

	September 1937	August 1937	September 1936
Electrical machinery and apparatus	$8,995,024	$8,981,110	$7,969,528
Power generating machinery except automotive and electric	1,322,998	1,412,965	513,762
Construction and conveying machinery	2,065,726	2,312,936	1,276,676
Mining, well and pumping machinery	4,640,089	5,708,431	2,683,478
Power driven, metal-working machinery	3,901,722	4,190,386	3,276,152
Other metal-working machinery	358,214	384,366	229,773
Textile machinery	1,024,801	1,034,596	725,182

Exports of Metal-Working Machinery During September, 1937

	September 1937	August 1937	September 1936
Engine lathes	$206,665	$260,619	$113,794
Turret lathes	365,039	222,946	208,246
Other lathes	89,965	99,875	90,402
Vertical boring mills and chucking machines	193,633	147,721	199,623
Thread cutting and automatic screw machines	238,854	232,598	165,861
Knee and column type milling machines	223,911	223,766	106,849
Other milling machines	162,601	278,203	273,624
Gear cutting machines	156,045	142,769	343,739
Vertical drilling machines	38,082	41,599	15,656
Radial drilling machines	68,288	37,874	10,656
Other drilling machines	104,972	61,119	113,602
Planers and shapers	73,891	45,112	30,648
Surface grinding machines	178,150	84,979	75,321
External cylindrical grinding machines	53,062	103,325	16,590
Internal grinding machines	103,516	170,487	124,567
Toll grinding, cutter grinding, and universal grinding machines	188,624	154,398	130,369
Other metal grinding machines	111,079	174,398	176,875
Sheet and plate metal grinding machines	434,606	310,954	227,059
Forging machinery	62,784	162,455	11,050
Rolling mill machinery	77,322	442,430	353,802
Foundry and molding equipment	128,430	179,566	38,658
Other power-driven metal-working machinery and parts	642,203	613,193	449,250

Other Metal-Working Machinery

Pneumatic portable tools	90,598	127,624	72,142
Portable and hand and foot operated metal-working machines and parts	131,039	142,787	80,197
Chucks for machine tools	17,913	18,277	18,859
Milling cutters, machine-operated threading dies and taps and similar machine-operated metal cutting tools	66,863	49,852	28,666
Other metal-working machine tools	51,801	45,826	29,909

OBITUARIES

ELIHU R. LYMAN, president of the Massachusetts Gear & Tool Co., Woburn, died on Oct. 29 at his home in that city. He was born in Belchertown, Mass., 53 years ago; was graduated from Worcester Polytechnic Institute in 1902 and was a member of the executive committee of the Massachusetts Metal Trades Association.

WILBUR FISKE BURNS, formerly vice-president and treasurer of the Burns & Bassick Co., Bridgeport, Conn., now a subsidiary of the Stewart-Warner interests, died recently at his home in Fairfield, Conn. Mr. Burns was also a former treasurer of Alemite Corp.

WILLIAM RICHABDSON DEWEY, president and treasurer of the Waters Governor Co., Everett, Mass., died at his home in Newton, Mass., on Nov. 1 at the age of 74.

ERNEST E. FINCH, vice-president and general manager of the Karl Kiefer Machine Tool Co., Cincinnati, died recently there at the age of 62.

ROBERT R. LEEDS, 66, assistant to the general manager of the P. & F. Corbin Co., New Britain, Conn., died Nov. 1. Mr. Leeds had been associated with the hardware manufacturing company eight years and previously was associated with the Russell & Irwin Co. for 40 years. Both companies are divisions of the American Hardware Corp.

WILLIAM C. BUELL

William C. Buell Is Dead

William Collins Buell, vice-president and secretary of the Diamond Machine Co., and assistant treasurer of the Builders Iron Foundry, died October 21 while enroute by sea to California. For some years prior to his death, Mr. Buell was relatively inactive in business, but was identified with it as consultant. During the World War he speeded the production of machinery for drilling, reaming, and rifling gun barrels for the Allied governments as well as for American manufacturers. Few men have had a wider circle of friends in the metal-working industry.

ROSS GARRISON BENNETT, works manager of the Bryant Electric Co., Bridgeport, Conn., for the last nine years, died Nov. 7 at Asheville, N. C. Mr. Bennett was 41 years old and began with the Bryant Company 20 years ago.

SHERWOOD J. S. ROGERS, 76, founder and president of the Rogers Manufacturing Co., manufacturers of sharp-edged tools and hardware, died Nov. 3. Mr. Rogers was head of his company for 50 years.

ARTHUR JOHN RAMSEY, vice-president of Pittsburgh Rolls, a division of Blaw-Knox Co., died at the age of 63.

BUSINESS ITEMS

SKF Steels, Inc., has opened its principal warehouse at 110 Frelinghuysen Ave., Newark, N. J., in which will be stored a complete stock of tool-steel and chrome-steel tubing and bars.

Atlas Press Co., Kalamazoo, Mich., recently completed an addition to provide 15,000 sq. ft. of additional floor space for increased production of bench lathes, shapers, drill presses and arbor presses.

R. G. Haskins Co., Chicago, flexible-shaft machinery and high-speed tapping equipment, has appointed Wright & Gade Equipment Co., 3701 N. Broad St., Philadelphia, as representatives in Delaware, Maryland, eastern Pennsylvania and southern New Jersey.

The Lincoln Electric Co. has opened a new sales office at Phoenix, Ariz., under the charge of R. J. Reardon who, for the past six years, was with the American Metal Products Co., Detroit, as welding engineer and supervisor.

The Leach Mfg. Co., Providence, R. I., will reorganize Cornwall & Patterson Co., Bridgeport, Conn., former hardware manufacturer and will manufacture specialties.

Assets of the Esco Engineering Service Co., Toledo, manufacturer of jigs and tools, have been purchased by the Regal Engine Co., Coldwater, Mich. Esco will retain its identity as a division of Regal, with sales and engineering offices at 1010 Beaubien St., Detroit. FRANCIS J. MCGARRY, founder of Esco, will be in charge of field engineering and sales, and FREDERICK M. ROSS will have general charge of the Detroit office.

New officers of the Regal Engine Co. are: W. J. CARLISLE, president; ROBERT W. ALLEN, vice-president and secretary; FRANCIS J. MCGARRY, vice-president in charge of sales; FREDERICK M. ROSS, vice-president and chief engineer, and JOHN N. HARDY, treasurer.

PATENTS

October 26, 1937

Metal-Working Machinery

Machine Tool. Alexander Pberhoffken and Earl M. Bowen, Rockford, Ill., assigned to The Ingersoll Milling Machine Co., Rockford, Ill. Patent 2,096,754.

Tool Feeding Mechanism for Lathes. William F. Groene, Cincinnati, Ohio, assigned to The R. K. Le Blond Machine Tool Co., Cincinnati, Ohio. Patent 2,097,096.

Rivet and Cap Setting Machine. Arthur R. Havener, Wayland, Mass., assigned to Judson L. Thomson Manufacturing Co., Waltham, Mass. Patent 2,097,248.

Feed Mechanism for Lathes. Richard K. Le Blond and Harry C. Kemper, Cincinnati, Ohio, assigned to The R. K. Le Blond Machine Tool Co., Cincinnati, Ohio. Patent 2,097,375.

Welding Machine. William H. Martin, Detroit, Mich. Patent 2,097,377.

Electric Welding Circuit Timer. Edward G. Beiderman, Detroit, Mich., assigned to Edward G Budd Manufacturing Co., Philadelphia, Pa., Patent 2,097,410.

Processes

Method of Forming Pressed Sheet Metal Spoked Wheels. John MacLennan, Detroit, Mich., assigned to Kelsey-Hayes Wheel Co., Detroit, Mich. Patent 2,097,101.

Tools and Accessories

Punch. Albert Azer, Detroit, Mich. Patent 2,096,778.

Micrometer Caliper. Arthur Brown, Cranston, R. I. Patent 2,096,956.

Electrode for Electric Arc Welding. Georg Bock and Edmund Schröder, Berlin, Germany. Patent 2,097,386.

November 2, 1937

Metal-Working Machinery

Grinding Machine. Harold L. Blood, Worcester, Mass., assigned to The Heald Machine Co., Worcester, Mass. Patent 2,097,429.

Metal Working Machine. Harry W. Rupple, Shaker Heights, Ohio, assigned to The Cleveland Automatic Machine Co., Cleveland, Ohio. Patent 2,097,646.

Grinding Machine for Reamers and Like Tools. Albert C. Hoeh, Royal Oak, Mich. Patent 2,097,664.

Roller Bearing Assembling Machine. Frank Ketcham, Dearborn, and George E. Dunn, Detroit, Mich., assigned to Universal Products Co., Inc., Delaware. Patent 2,097,669.

Grinding Machine. Raymond A. Cole, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,097,783.

Grinding Machine. Ledgeworth G. Casey, Cincinnati, Ohio, assigned to The Cincinnati Electrical Tool Co., Cincinnati, Ohio. Patent 2,097,944.

Nibbling Machine, Harry W. Williams, Dayton, Ohio, assigned to The National Cash Register Co., Dayton, Ohio. Patent 2,098,022.

Parts and Mechanisms

Clutch Mechanism. Arthur William Mall and Thomas A. Long, Chicago, Ill., assigned to Mall Tool Co., Illinois. Patent 2,097,731.

Grinding Wheel. Baalis Sanford, Worcester, Mass., assigned to Norton Co., Worcester, Mass. Patent 2,097,803.

Welding Electrode. Franz R. Hensel and Earl I. Larsen, Indianapolis, Ind., assigned to P. R. Mallory & Co., Inc., Indianapolis, Ind. Patent 2,097,816.

Balancing Device for Grinding or Polishing Wheels. John Roche, Battle Creek, Mich. Patent 2,097,894.

Processes

Method of Grinding Screw Threads in Shouldered Work. Stanley Jaffa Harley, Stivichall, Coventry, England. Patent 2,098,145.

Tools and Accessories

Die. Harvey W. Riddle, Worcester, Mass., assigned to The American Steel & Wire Co. of New Jersey. Patent 2,097,644.

Adjustable Hollow Mill. Ole Severson, Shelton, Conn., assigned to The O. K. Tool Co., Inc., New York, N. Y. Patent 2,097,898.

Grinder Attachment. Ernie L. Hussmann, Seiling, Okla. Patent 2,098,147.

MEETINGS

AMERICAN ENGINEERING COUNCIL. Eighteenth annual assembly, Jan. 13-15. Hotel Mayflower, Washington, D. C.

AMERICAN FOUNDRYMEN'S ASSOCIATION. Joint conference with Buffalo Chapter and Cornell University, Nov. 26-27. Willard Straight Hall, Ithaca, N. Y.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS. Annual meeting. New York, N. Y. December 6-10. Secretary, 29 W. 39th St., New York.

AMERICAN STANDARDS ASSOCIATION. Annual Meeting, Dec. 1. Hotel Astor, New York.

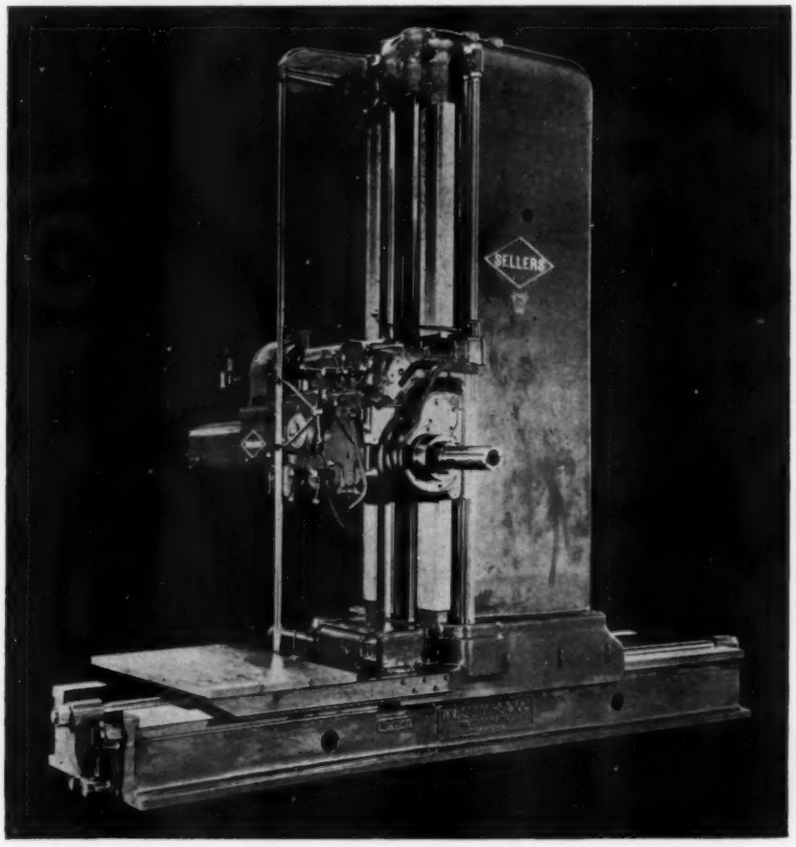
CHEMICAL EXPOSITION. Grand Central Palace, New York. Dec. 6-11.

NATIONAL ASSOCIATION OF MANUFACTURERS. Annual meeting, Dec. 7-9. Waldorf-Astoria Hotel, New York.

NATIONAL STANDARD PARTS ASSOCIATION. Annual convention and show, Nov. 29-Dec. 11. The Sherman Hotel, Chicago.

SOCIETY OF AUTOMOTIVE ENGINEERS. National Production Meeting. Hotel Durand, Flint, Mich. Dec. 8-10.

SHOP EQUIPMENT NEWS



Sellers No. 504 Floor-Type Horizontal Boring, Drilling and Milling Machine

Head of the floor-type horizontal boring, drilling and milling machine announced by William Sellers & Co., Inc., 1600 Hamilton St., Philadelphia, Pa., is a complete power unit containing the forward and reverse driving clutches, all speed and feed changes and hand and power traverse to both spindles, head, saddle and table. Driving motor is mounted on the head, giving a short, efficient application of power to the cutting tools. Entire feed and traverse mechanism and the driving mechanism are built in units. Each unit is readily removable from the head. Multiple-disk clutches drive the machine forward and reverse. No separate gear shift is required for reversing.

This machine is controlled entirely from the unit head. The main forward and reverse lever is on the front of the head above the spindle, where the operator can start, stop, jog or reverse his spindle, with taps, drills, boring and milling cutters in full view. Speed and feed change levers are adjacent to this lever, permitting shifting gears with one hand and operating the clutch lever with the other. By means of a directional control lever on the head, the spindle can be fed in or out of the head without reversing the direction of spindle rotation. This directional control lever, when used in conjunction with power traverse, gives a fast power movement of the spindle in or out of the head and eliminates winding the spindle in or out by hand.

A micrometer dial is provided on the front of the head, beside the spindle, for accurately positioning the spindle. Another micrometer dial, beside the pilot wheel, provides for final positioning of the head and column from the operator's platform. Hand adjustment with a micrometer dial is provided at the base of the column for final positioning of the column on the runway.

Graduated scales are also provided on the column for positioning the head, and on the bed for positioning the column. As an extra, precision measuring equipment can be provided for positioning the head and column by means of pin gauges and dial indicators. Verniers can be provided for the head and column, if they are preferred. An auxiliary, high-speed spindle can be furnished as an extra. This auxiliary spindle revolves only when desired. At all other times it is inoperative and not subject to wear.

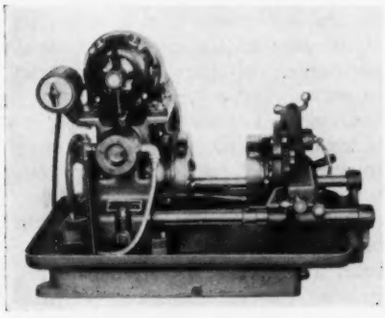
Specifications for the 5-in. No. 504 Type A machine shown in the accompanying illustration: Diameter of spindle, 5 in.; Morse taper in spindle, No. 7; stroke of spindle, 36 in.; vertical travel of head on column, 72 in.; maximum distance from center of spindle to ways on bed, 97 in.; minimum distance from center of spindle to ways on bed, 25 in.; distance across ways on column, 30 in.; horizontal travel of column on bed, 96 in.; distance across ways on bed, 44 in.; number of main spindle speeds, 24; range of main spindle speeds, 5.8 to 334 r.p.m.; number of feeds to spindle, head and column, 24; range of feeds per revolution of spindle, 0.0025 to 0.625 in. Where an aux-

iliary spindle is furnished, this spindle has fourteen speeds ranging from 100 to 1,000 r.p.m. Auxiliary spindle feeds range from 0.001 to 0.208 in. per revolution in 24 steps. All feeds are non-overlapping and there are 24 distinct spindle feeds for each of the 24 spindle speeds.

One 15 hp., 1750 r.p.m. motor is required for driving this machine. Standard motor is a three-phase, 60 cycle, 220-volt standard a.c. unit having a disk-type, motor-mounted solenoid brake. A magnetic, non-reversing, starting and push-button control station is provided as standard equipment.

Oster No. 512-A Pipe Machine

Designed to round out a line of ½- to 2-in. pipe threading machines, the No. 512-A "Tom Thumb" machine, announced by The Oster Mfg. Co., 2057 E. 61st Place, Cleveland, Ohio, is equipped with a diehead that is integral with the



carriage. Threading dies are rigidly supported, insuring accurate work and increased die life. Diehead is of the front-cutting type which, together with the close-grip front chuck, makes it possible to handle pieces as short as 2½ in. without using a nipple chuck.

Size setting marks are on top of the head, where they are plainly visible. An internal system furnishes oil to the dies and the cut-off tool. Flow of oil is controlled by a thumb valve. Over-all length of the machine is 34 in., width is 21 in., and height is 24 in. Net weight is 375 lb.

Fafnir Self-Aligning Ball Bearings

Three types of self-aligning ball bearings, available in a full range of sizes, are offered by The Fafnir Bearing Co., New Britain, Conn. In the Type B bearing, the conventional outer ring is made with a spherical instead of cylindrical, outside surface. A concave inner surface in the housing, which corresponds to the convex outer surface of the ring, permits the bearing to swivel into true alignment with the shaft.

The Type S bearing permits the conventional cylindrical surface of the housing to be retained by providing an extra self-aligning ring with a concave inner surface. This extra ring surrounds the spherically ground outer bearing ring to form the alignment socket. Mounting is similar to ordinary radial bearings. Self-alignment entirely from within the outer bearing ring is provided in the Type L bearing. This permits the housing to be both straight-bored and of minimum diameter. A double row of balls is used in all Type L bearings, including single row widths. The two rows of balls, tracked by two races on the inner ring, are left free to locate themselves in one spherical race on the outer ring. Here, the balls themselves roll the inner ring and shaft into alignment. Self-aligning bearings come in single-row, double-row, and wide inner-ring types.

Thompson-Gibb "Universal" Spot Welder

The lower arm of this "Universal" spot welder, announced by Thompson-Gibb Electric Welding Co., 164 Pleasant St., Lynn, Mass., can be arranged in any one of three positions to accommodate work of various shapes. Both the upper and lower arms can be fitted with a variety of electrode holders, most of which are arranged so that the points can be swiveled to almost any angle. The accompanying views show the welder equipped with a special toggle linkage which actuates the rocker arm and develops pressure without slamming the electrode. This arm is made of aluminum to reduce its moving weight.

When additional clearance is required around the upper arm, it is possible to remove the toggle mechanism and supporting members. The rocker arm is then actuated by means of a pressure cylinder set on a bracket at the rear of the machine. Welder is powered by a 300-kva. transformer and develops welding pressures up to 3,500 lb. Stroke is adjustable from 0 to 6 in. The throat depth is 36 in. when the lower arm is set up in the vertical position as shown in Fig. 1, or 42 in. in either the 45 deg. or the horizontal positions, as shown in Fig. 2 and Fig. 3. This all-purpose welder is claimed to be particularly suitable for spot welding aluminum, stainless steel and non-ferrous alloys.

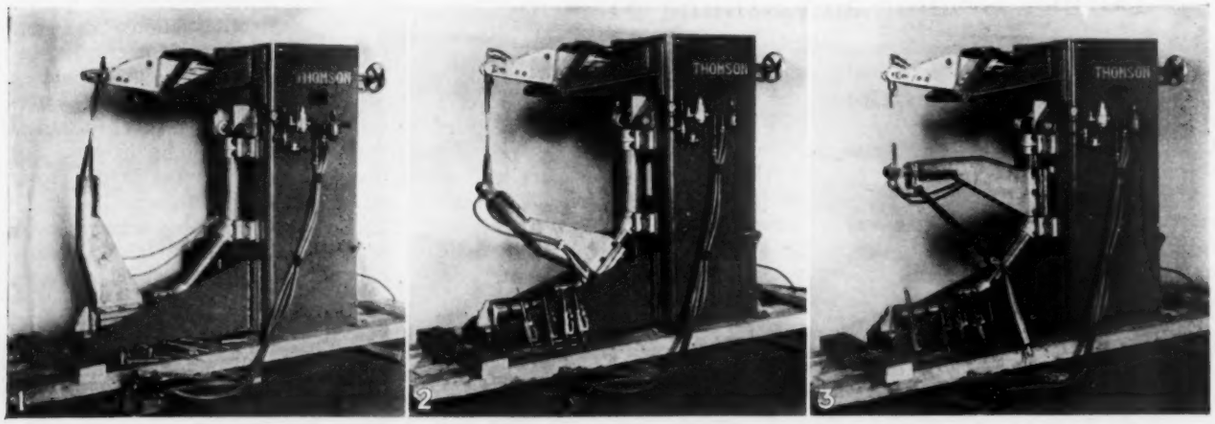
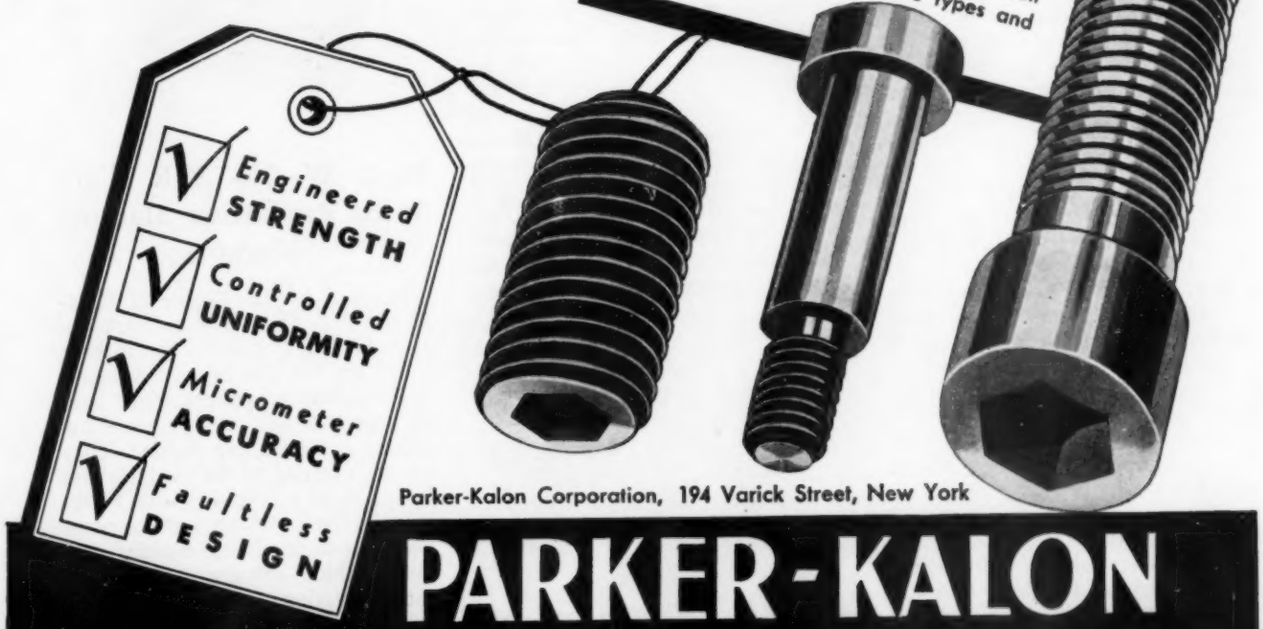


Fig. 1—When set up with the lower arm in a vertical position, the Thompson-Gibb "Universal" spot welder has a throat depth of 36 in. Fig. 2—Mounting the lower arm at 45 deg. position increases the throat depth to 42 in. Fig. 3—A bar is provided to support the lower arm when mounted in the horizontal position. Throat depth with this arrangement is also 42 in.

FROM THE PARKER-KALON LABORATORY

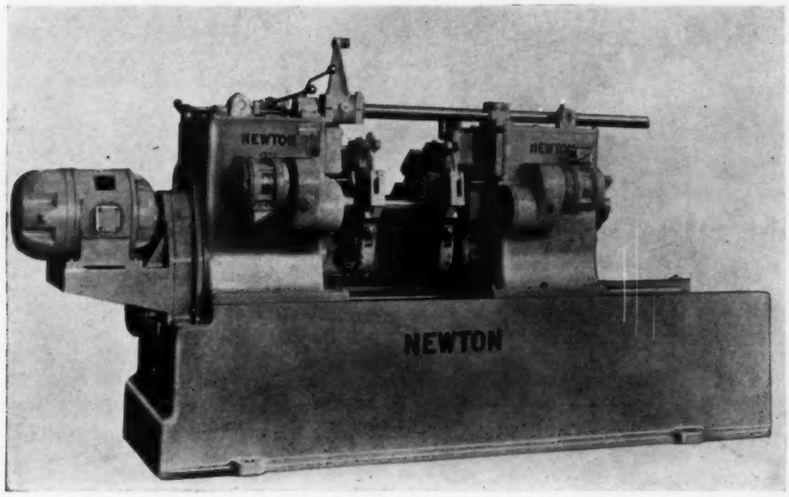
COMES A *higher standard of quality* IN SOCKET SCREWS

It took over two years of intensive research and development work; and an investment of $250,000 in new laboratory equipment to produce Socket Screws good enough to uphold the Parker-Kalon reputation. When you get samples of the new Parker-Kalon Cold-forged Socket Screws, you will agree that the result fully justifies the expenditure of effort and money. Judged by any standard, these new Screws will measure up to your ideas of what good Socket Screws should be. Send for bulletin that gives full details and free samples of the types and sizes you use.



Parker-Kalon Corporation, 194 Varick Street, New York

PARKER-KALON *Cold-forged* SOCKET SCREWS



Newton Drum-Type Shaft Milling and Center-Drilling Machine

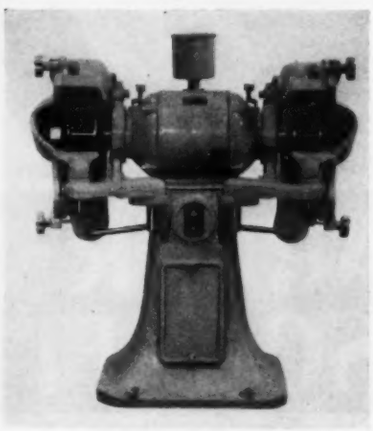
Designed to combine the operations of face milling and center drilling on both ends of shafts simultaneously, this milling and drilling machine offered by Newton Division, Consolidated Machine Tool Corp., Rochester, N. Y., uses a three-station universal fixture arranged to dwell against index pins while drilling and loading. The cycle of operation is as follows: (1) Work is loaded at the front of the machine and operator engages a lever which reverses the drill spindles that have just finished center drilling at the third station so that they back out and clear the work. (2) The operator releases index pins and starts the drum in rapid approach, this changes automatically to feed and both ends of the shaft are face milled. At the conclusion of the cut, the drum again changes to rapid traverse and stops against the index pins. (3) At the third position, the operator throws a lever which starts the center drills into feed. While ends of the shaft are being center drilled, the operator is unloading finished work and reloading. Cycle is repeated after the holes have been center drilled.

Two milling spindles are mounted directly opposite each other, one in each head. One head is bolted in a stationary position and the second head is adjustable along the base. Both heads are driven from one motor mounted on a bracket near the floor. The two drilling spindles are also directly opposed, one on each head. Each drill spindle has separate motor drive connected through suitable reduction gears. Pick-off gears are arranged for changing speed.

Drilling feed is obtained hydraulically as each drill spindle is mounted in a sleeve which is arranged to slide horizontally by hydraulic pressure. Oil for feeding the drill spindles is supplied by hydraulic pump and provision is made for regulating the rate of feed. Stops are provided for regulating the depth of drilling.

Clark 5-Hp. Grinder

Designed for heavy production grinding, the 5-hp. narrow-base grinder offered by James Clark Jr. Electric Co., Inc., 600-640 E. Bergman St., Louisville, Ky., is powered with a totally inclosed motor. Motor frame is small in diameter, permitting maximum wheel wear and maximum clearance for work. Tool rests are mounted on the grinder pedestal to insure maximum strength. Control pushbutton is easily reached.

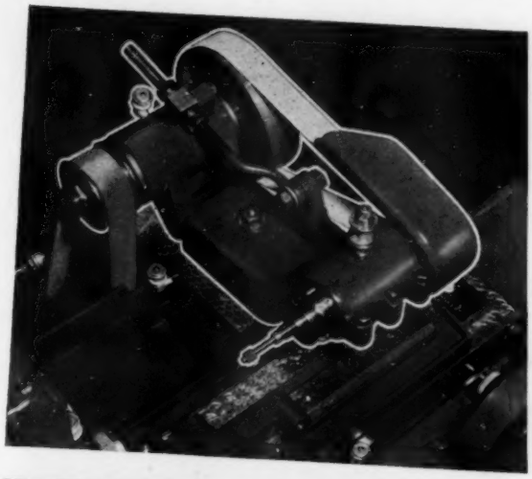


This grinder is equipped with a magnetic starter having overload and low-voltage protection. Inclosed safety guards with hinged covers and exhaust connections are provided. These guards are adjustable around the periphery of the wheel and are adjustable for wheel wear. Equipment also includes non-shatterable glass eye shields, tool rests with horizontal and vertical adjustment, and a water pot.

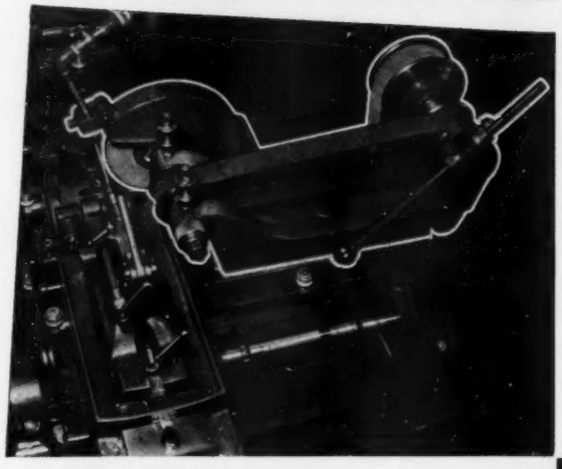
Specifications: Height over-all, 46 in.; height to center of spindle, 35 in.; distance between wheel centers, 31 in.; size of wheel, 18x3x1¾ in.; floor space required, 24x44 in.; size of base, 24x26 in.; weight, 725 lb.

N. & W. No. 20-R High-Speed Production Marking Machine

Developed by The Noble & Westbrook Mfg. Co., 20 Westbrook St., East Hartford, Conn., for making metal articles, the No. 20-R marking machine is power driven and the operator has only to place the articles in the feeding position. They are then carried to the marking dies by means of a revolving dial. Marking dies consist of three sets of numbering and descriptive marking segments which are arranged so that the inscription is spaced centrally between the key holes and the chuck body, for which this machine is arranged. Guide pins have been provided on the die holder of the machine so that when the article reaches the beginning of the mark-



Internal-External Grinding



INTERNAL GRINDING

Internal spindle is driven by belt from main drive motor, as shown at left above, at speeds up to 35,000 r.p.m. Holes from the smallest up to 3″ diameter can be ground with maximum 4″ power or 11″ hand table reciprocation.

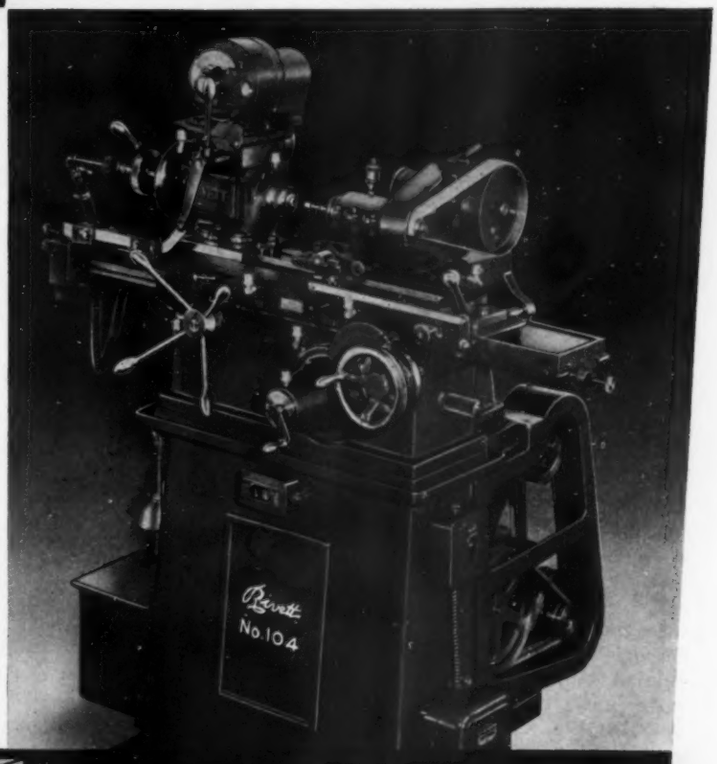
EXTERNAL GRINDING

External grinding attachment readily interchanges with internal spindle bracket on the cross slide, as shown at left, and is used for grinding straight and taper diameters or bevels. A wheel up to 6″ maximum diameter by 1/2″ face can be used.

RIVETT No. 104 GRINDER

is designed to meet the demand for a small grinder suitable for precision tool making and accurate manufacturing. It may be used as a single-purpose production machine or for the many internal and external grinding requirements of the tool room. Its ease of set-up and wide range of adjustment make it more economical on small lots of parts than a heavier machine.

Although primarily an internal grinder, an external grinding attachment is offered to interchange with the internal spindle bracket. The Rivett fixed diamond is used both for truing either internal or external wheels and for maintaining sizes on duplicate work. For further information write for bulletin 104-C.



RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.

ing point the guide pins fit into the key holes and keep the article in proper position for marking. This insures correct location of the inscription in relation to the holes.

The carrying dial, which is also a pressure dial, has a vertical adjustment for raising or lowering the inscription on the articles and the marking dies can be individually adjusted for depth of inscription. Different die holders can be used for different sizes of chuck bodies so that bodies ranging from ¾ to 2½ in. diameter can be marked on the same machine.

Oilgear "Fluid Power" Units

"Fluid Power" variable- and constant-displacement pumps and motors, offered by The Oilgear Co., 1319 W. Bruce St., Milwaukee, Wis., have been redesigned to simplify their construction. More than 20 sizes of radial piston pumps and motors are available for pressures up to 3,000 lb. per sq.in., each with compact, interchangeable control devices. Three series of pumps and motors, with working pressures of 1,100, 1,700 and 2,500 lb. per sq.in., respectively, are available to suit individual installation requirements. The 2,500 lb. series can be used for peak pressures up to 3,000 lb. per sq.in.

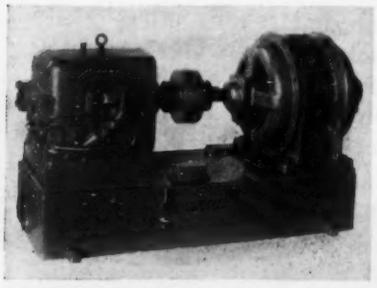


Fig. 1—Oilgear Type DH fluid power two-way pump with Servo-motor lever control. Stepless variation of fluid power is delivered in either direction

Fig. 1 shows a Type DH-6017 two-way variable displacement pump with a direct-connected electric motor drive mounted on a common base. This pump unit is equipped with a hydraulic Servo-motor lever control. Finger-tip actuation of a small lever provides stepless variation of fluid power delivered in either direction from zero to maximum. Movement of the control lever through an angle of 50 deg. to either side of the neutral bypass or idle position increases the displacement automatically in proportion to the movement of the control lever.

A Type C "Fluid Power" motor is shown in Fig. 2. These motors are of the constant-torque type, maximum torque being available at all speeds. Horse-power transmitted is directly proportional to the speed at which the motor operates. Power input of the pump is proportional to the speed and torque demand of the motors. A very small delivery of oil by the pump will raise sufficient pressure to overcome initial friction and inertia load on the motor and put it in motion. Features claimed for these motors are stepless, infinitely variable speed in either direction with smooth, uniform acceleration and deceleration. Output shaft can be rapidly reversed and operating torque is adjustable.

Fig. 2—Actual power input required to start a load with the Oilgear Type C constant-displacement motor is low

Stow Models P and V Flexible-Shaft Units

Two lines of flexible-shaft toolroom units have been announced by Stow Mfg. Co., Inc., Binghamton, N. Y. Both types are equipped with a ball-bearing countershaft which gives three spindle speeds by shifting the V-belt. Countershaft is hinged and is provided with a screw for belt adjustments.

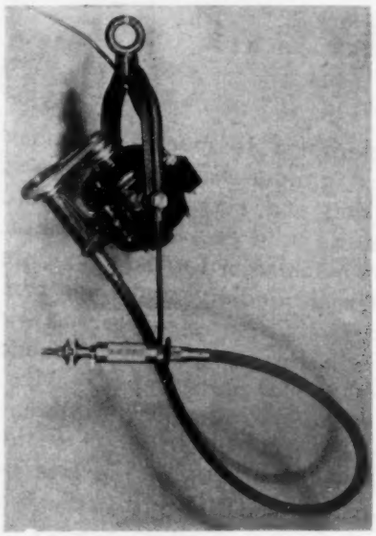
Fig. 1—Assembly P, bench-type flexible-shaft unit is designed for bench mounting and has a three-speed countershaft

Each type is available in ⅛, ¼, ½ and 1-hp. capacities. The ⅛ and ¼ hp. units each have two speed ranges, giving shaft speeds of 6,800, 3,425 and 1,800 r.p.m. or 3,400, 1,725, and 900 r.p.m. The ½-hy. units shaft speeds of 3,400, 1,725 and 900 r.p.m., while the 1-hp. units have shaft speeds of 6,800, 3,425 and 1,800 r.p.m. Shaft core sizes range from ¼ to ⅝ in. diameter and shaft lengths range from 4 to 6 ft.

The ball-bearing hand-piece furnished as standard equipment has a clamp spindle to take grinding wheels, buffs and scratch brushes. Angle heads and special hand-pieces can be interchanged with the standard hand-piece.

Assembly P is designed for bench mounting and is shown in Fig. 1. This unit may be mounted on a bench, truck or on a wall in back of the bench. Assembly V is designed for use in shops where floor space is at a premium. It may be mounted on a trolley or suspended from a hook. Both models are equipped with hangers that have both horizontal and vertical pivots and the suspended model has a hook support for the hand piece when not in use.

Fig. 2—Stow Assembly V, flexible shaft unit is designed for suspension from a trolley or hook in shops where floor space is at a premium



B. & D. "Shorty" Electric Drill

Chuck spindle of the "Shorty" ball-bearing electric drill, announced by Black & Decker Mfg. Co., Towson, Md., is mounted at right angles to the motor, reducing the over-all working length of the tool to 4½ in.

When the end of 1937 rolls around and industry adds up the items of plant operating cost directly attributable to friction, an amazing total of *four billion dollars* will appear at the foot of the column! A staggering loss to American industry in a single year.

What is being done to reduce it? A relentless battle is being waged against the wastes of friction every day by Gulf's large staff of trained lubrication engineers. These men, real lubrication specialists, work with plant operating men to make machines produce on a more efficient basis.

In their broad experience they have found literally dozens of ways to save money by better selection of lubricants and better application methods.

Plant managers who take advantage of this cooperative service, available from Maine to Texas, save money—in reduced costs for power and for maintenance, and in improved production from each machine in the plant.

Let a Gulf engineer recommend—from Gulf's complete line of 553 oils and greases—the lubricants which will help *you* reduce the wastes of friction in *your* plant.

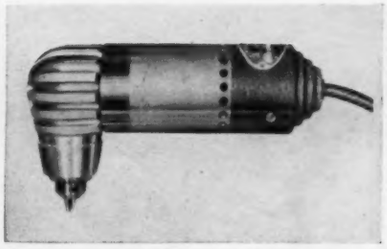
GULF INDUSTRIAL LUBRICATION

Gulf Oil Corporation ★ Gulf Refining Company

GENERAL OFFICES: GULF BUILDING, PITTSBURGH, PA.

Motor housing dimensions have been reduced to a minimum so that the tool fits snugly in the operator's hand.

This drill is available in $\frac{3}{16}$ or $\frac{1}{4}$ in. capacities, each size having a net weight of approximately $3\frac{1}{2}$ lb. Over-all length in direction of chuck spindle is $4\frac{1}{2}$ in. This dimension is $7\frac{3}{4}$ in. in the direction of the motor. The $\frac{1}{4}$-in. capacity tool has a no-load speed of 2,500 r.p.m. and a full-load speed of 1,600 r.p.m. The $\frac{3}{16}$-in. tool has a standard no-load speed of 3,700 r.p.m. and a



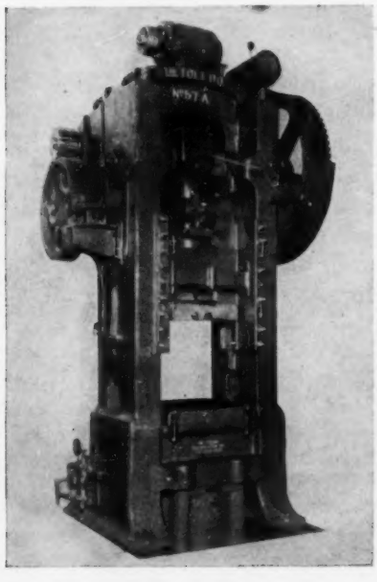
full-load speed of 2,300 r.p.m. An optional speed range of 5,000 r.p.m. at no load and 3,200 r.p.m. at full load is available for this larger tool.

Toledo No. 57-A Single-Action Press With Hydro-Pneumatic Die Cushion

The No. 57-A single-action general-purpose press announced by the Toledo Machine & Tool Co., 1420 Hastings St., Toledo, Ohio, is fitted with a semi built-in, heavy-duty "Marquette" hydro-pneumatic die cushion. In its high range, this cushion gives about double the normal blank-holding pressure, adapting the unit to shape-stretching jobs requiring a heavy gripping pressure around the edge of the blank. On such work, it is claimed to be possible to use gripping pressures equal to or exceeding the drawing pressure.

Press is of the double-geared, single-end drive, single-action type with a gear ratio of 16 to 1, having a speed of 22 strokes per min. The 10-hp., 1200 r.p.m. high-slip motor drives the flywheel through V-belts. Electric push buttons control the multiple-disk, air-operated friction clutch, making it possible to inch, run or stop the press electrically. All main bearings are bronze bushed and are lubricated by a one-shot, manifold-type lubrication system.

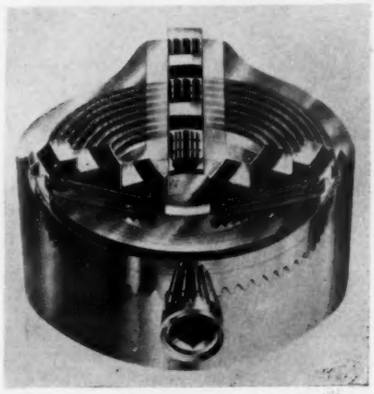
Specifications: Stroke 10 in.; stroke adjustment, 4 in.; shut height from bed to slide, stroke down and adjustment up, 20 in.; thickness of bolster, 4 in.; diameter of crankshaft at bearings, $6\frac{1}{2}$ in.; diameter of crankshaft at pins, $9\frac{3}{4}$ in.; size of bed, 32x32 in. Slide is counterbalanced by a weight in the gear wheel. The hydro-pneumatic cushion makes it possible to draw a shell up to $4\frac{3}{4}$ in. high.



Taylor Scroll-Type Self-Centering Chucks

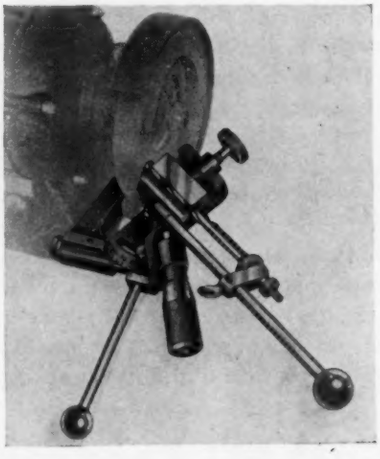
All moving parts of the Taylor self-centering scroll-type chucks, offered in the United States by George Scherr Co. Inc., 128 Lafayette St., New York, N. Y., are hardened and ground. Spiral is revolved by means of any one of three pinions. Its front face has the form of a hollow cone and is cut with a spiral V-thread which engages with the teeth cut in the back of the jaws, thus advancing or withdrawing the jaws simultaneously when the spiral cone is revolved. Jaws are supported immediately behind and at right angles to the line of pressure caused through gripping the work.

After hardening the jaws, they are ground on the parts that slide in the chuck body and that grip the work. Stepped jaws are available for general lathe work while plain jaws are available for bar work. Soft jaw blanks are available for machining to hold odd shapes of work. The front part of these jaws is left soft, but the teeth at the back are hardened, as are the parts which slide in the chuck body. Three-jaw chucks are available in sizes ranging from $4\frac{1}{2}$ to 20 in. They range in weight from $8\frac{3}{4}$ to 246 lb. and are suitable for a wide variety of applications.



Atlas Improved Drill Grinder

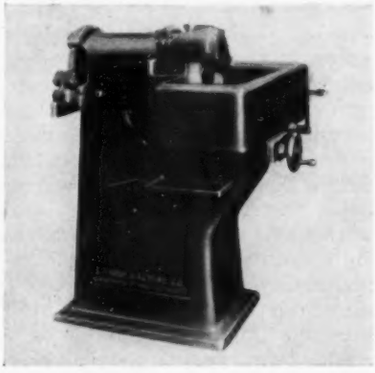
This drill grinding attachment, offered by Atlas Press Co., Kalamazoo, Mich., has been redesigned to move the chuck locking screw away from the grinder wheel and to increase the strength of the attachment. Attachment is adaptable to any grinder and any wheel thickness. It will sharpen any drill between $\frac{3}{32}$ and $\frac{1}{2}$ in. diameter and the chuck and V-block are designed automatically to center the drill. An adjustable shank stop, micrometer feed and special lip stop, which allows the drill to be turned exactly 180 deg. after the first lip has been ground, are provided. Model W30-40 is recommended for use with 6-in. diameter wheels, while Model W30-41 will clear 7-in. diameter wheels on standard bench grinders.



Landis Motorized Chaser Grinders

Designed to replace Model "Y" and No. 2 chaser grinders, three grinders have been announced by the Landis Machine Co., Inc., Waynesboro, Pa. These three grinders are of sufficient capacity to cover the entire range of sizes of Landis chasers for dieheads and threading machines. Grinding wheels are mounted directly on the armature shaft of the motor of these grinders, eliminating gear or chain drives. Two grinding wheels, one cup and one straight, are supplied as standard equipment. The straight wheel is used for grinding the rake angles of bolt chasers where a leadscrew is not used. A rest that is adjustable to any angle is provided to facilitate this operation. The straight wheel may also be used for miscellaneous grinding. Cup wheels are used for grinding the lead and rake angles of all pipe chasers and bolt chasers when the thread is to be cut with the use of a leadscrew.

Smallest machine of the line is the Model "O", which is designed



primarily for the grinding of chasers for the smaller sizes of dieheads. Small size makes this machine applicable for departmental use where a number of dieheads are employed.

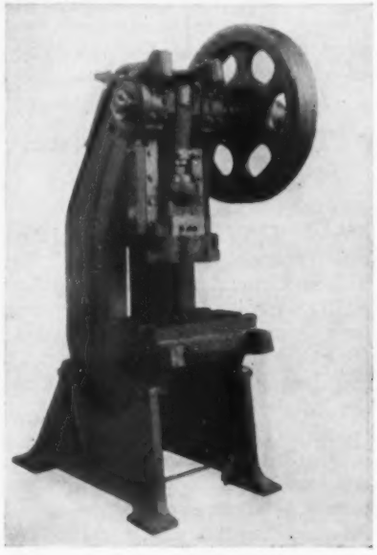
No. 1 grinder is a heavier machine which may be used for grinding chasers up to 1⅞ in. wide. This machine replaces the Model "Y" grinder and is adapted for use in tool rooms and for the production grinding of chasers. The largest chasers can be ground under the most severe production conditions in the No. 1½ grinder, which is the largest of the series. This machine is the only one of the three models in which means are provided for the use of a coolant on the cutting wheel. This large grinder is also the only unit that employs a traversing table at the cup wheel end.

Model "O" and No. 1 grinders employ a swivel head mounted on a cylindrical base which is swung to traverse the chaser across the face of the grinding wheel. A screw is provided through the spindle to adjust the chaser with relation to the wheel. Chaser clamping screw contacts the chaser on the dovetail surfaces in the same manner as the chaser clamp on a diehead. This provides a rigid and secure support to the chaser and insures that the rake and lead angles are accurately ground. The swivel head is graduated so that any degree of rake and lead angle may be obtained.

Oster No. 222 Improved Torch Cutting Machine

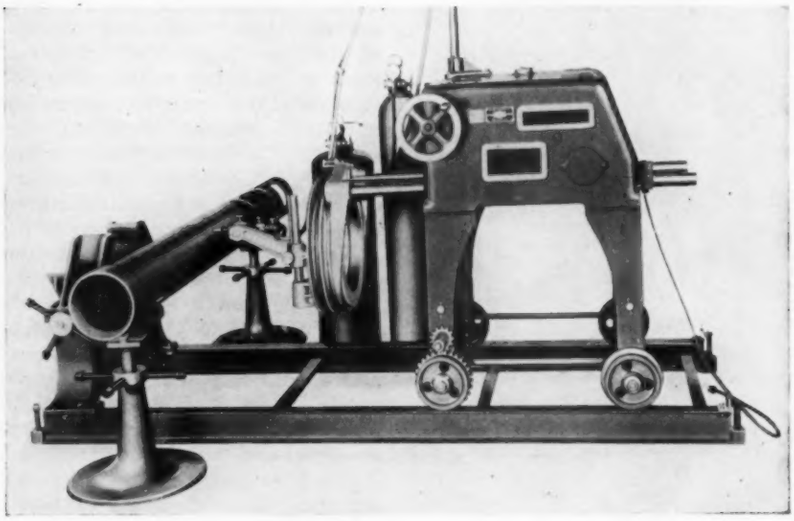
Cutting torch of the No. 222 cutting machine, offered by the Oster Mfg. Co., 2057 E. 61st Place, Cleveland, Ohio, is guided by a mechanism which duplicates the motion of a torch held in the operator's hand. It will cut pipe from 2½ to 12 in. diameter, making tees, reducing tees, branch reducing tees, elbows, miters, Y's and blunt bull plugs, as well as cut holes in pipes of these diameters.

The case containing the generating mechanism is mounted on four legs which are equipped with flanged wheels running on a track. Pipe is centered in a vise and supported on roller pipe rests, if the length requires additional support, for straight cutting. If a hole is to be cut in the pipe, it is placed at right angles to the torch carrier, on the roller pipe rests. Settings of the generating mechanism are regulated by positioning a rotating beam or lever, which operates a reciprocating slide. Beams are marked to show the settings for the various sizes and types of cuts, so that it is a simple matter for the operator to make the correct setting for all work within the capacity of the machine.



Marquette Slide Cushion

The Marquette Tool & Mfg. Co., 1420 Hastings St., Toledo, Ohio, has announced a compact, pneumatic slide cushion, shown here mounted on the slide of a No. 21-B slip punch press. These cushions can be used in conjunction with "Calleson" blanking, drawing and curling dies to replace the springs or rubber cushions. They are also adaptable to stripping and blank-



holding operations of various types.

It is claimed that the functioning of this cushion as a stripper has a number of advantages over the spring-type stripper. No jacking-back of the stripper plate against stiff springs is necessary when setting dies. All that is required is to release the air from the cushion and the stripper plate will slide easily.

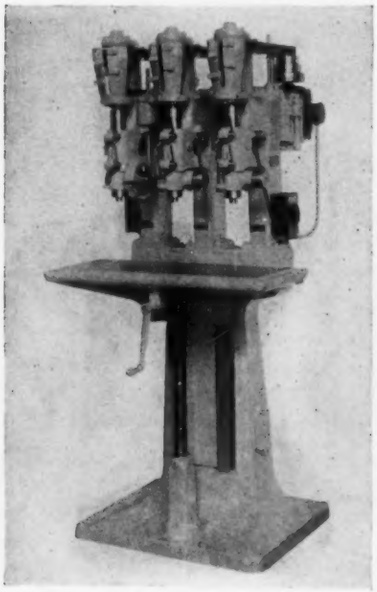
A single-action press can be converted into a triple-action press through the use of one of these slide cushions and the installation of regular bed-type cushions.

"Demco" Motor-Driven Sensitive Drills

Models DAV and DBV sensitive drill presses, announced by The Toledo General Manufacturing Co., 3620 Summit Ave., Toledo, Ohio, have separate vertical-motor drive for each spindle. The Model DAV machines have $\frac{3}{8}$-in. capacity, while the Model DBV units have $\frac{5}{8}$-in. capacity.

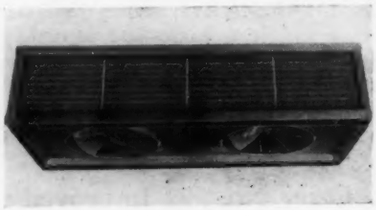
Standard ball-bearing motors are mounted on a hinged bracket and have a four-step cone drive pulley mounted on the motor shaft. The hinged motor bracket has a belt take up feature which is controlled from the front of the machine. Flat, endless belts are used.

Four standard speeds are furnished for each machine. These can be increased to eight spindle speeds by the use of two-speed motors. Both models can be furnished with power feed to the spindles and both are available in front one to six spindle units.



Trane Multiple Projection Heater

The lightness and flexibility of the propeller-type unit heater is combined with the long-range delivery and large capacity of the heavier blower-type heater in the multiple-projection heater announced by The Trane Co., LaCrosse, Wis. This heater is a high-velocity multiple-fan unit, with each fan under individual control. It is arranged for



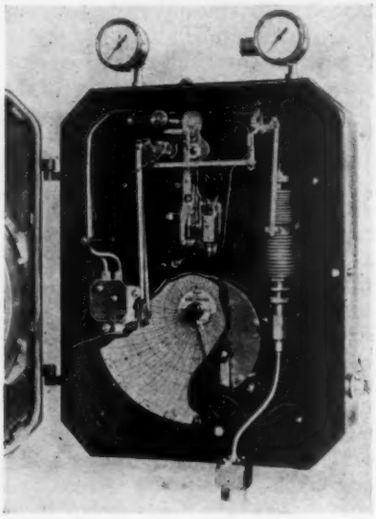
ceiling-mounting and warm upper air is drawn through the two coils and then projected straight downward in a vertical stream, which reaches the floor where heat is needed.

This heater is designed for use where a maximum of space must be heated with a minimum number of units. It consists of two Trane extended-surface coils contained in a metal casing. Motors are mounted out of the path of the air on a resilient construction. A four-blade propeller fan, designed for silent operation, is employed.

Taylor Absolute-Pressure Instruments

A line of instruments announced by Taylor Instrument Companies, Rochester, N. Y., makes possible the accurate measurement and control of compressible fluids at low pressures by referring measurement to absolute zero pressure as a datum or reference point. Variations in barometric pressure are thus automatically compensated. This line of instruments includes indicating, recording and controlling types.

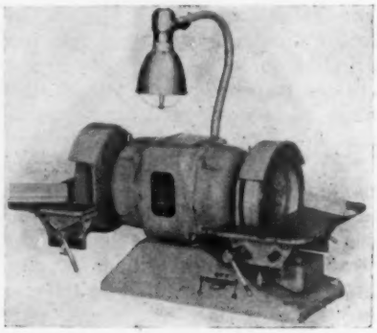
The absolute pressure element consists of a flexible phosphor-bronze bellows to the inside of which the pressure medium under measurement is communicated. Connected with this assembly, and opposing its action, is a second identical metal bellows which has been evacuated and sealed, thus comprising an atmospheric-pressure compensator. It is claimed that these instruments are applicable for all installations where the corresponding mercury-type gages can be used, with the exception of gases or vapors corrosive to the bronze bellows.

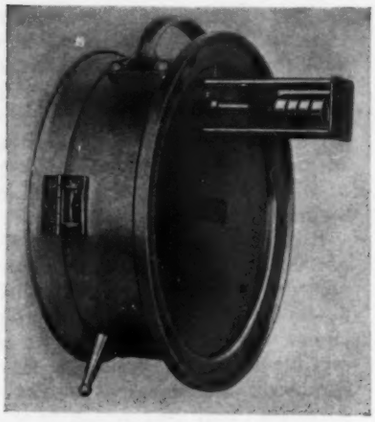


"Baldor" Carbide Tool Grinder

Powered with a $\frac{1}{2}$-hp. reversible motor, so that either right-hand or left-hand tools may be sharpened with the wheel always rotating towards the cutting edge, the carbide tool grinder announced by Baldor Electric Co., 4357 Duncan Ave., St. Louis, Mo., is equipped with two wheels. One wheel is used for roughing operations and the other for finishing. Grinder is designed to take a silicon-cup wheel on the left-hand side and either a silicon-cup or a diamond-cup wheel on the right side.

Standard equipment includes two 10 x $3\frac{1}{2}$ in. toolrest tables, two protractors to indicate the angle of the tool table, tool supports and a light which may be swung over either wheel. Motor operates at 3,400 r.p.m. and is of the ball-bearing type. Base is provided with holes for mounting to bench or pedestal.





Bristol Portable Recording Thermometer

The Bristol Co., Waterbury, Conn., offers a portable recording thermometer for use in travelling baking ovens, finishing ovens, and similar installations. This instrument can be passed through the oven on the conveyor with the work and will give a continuous record of the temperatures to which the heated product is subjected. Records are made on 8-in. round charts for 24-hr. or 7-day clock rotation. These instruments are self-contained and are light in weight.

"Haynes Stellite-2400" Metal Cutting Alloy

A cobalt-chromium-tungsten alloy for metal cutting tools has been announced by Haynes Stellite Co., 30 East 42d St., New York, N. Y. Known as "Haynes Stellite-2400," this alloy is claimed to have a greater edge strength and to operate with economical tool life at higher speeds than is possible with Haynes Stellite "J-Metal," with no reduction of feeds and depths of cut. Feeds and speeds recommended for its use are from 10 to 50 per cent in excess of those at which "J-Metal" is used.

Operating conditions recommended for the use of "Haynes Stellite-2400" tools are much the same as those recommended for all high-production cutting alloys. Fixtures, tool holders and work must be as rigid as possible. Tool overhang must be kept to a minimum and the tool should not project from the tool holder farther than its smallest cross-sectional dimension. Vibration and backlash must be held at a minimum and driving motors should have sufficient reserve power to provide for accidental overloads.

"Dyno-Mite" Midget Electric Drill

Millers Falls Co., 101 River St., Greenfield, Mass., has announced production of the "Dyno-Mite" streamlined electric drill which has an over-all length of only 8 in. and width of 2½ in. Motor is housed in a die-cast aluminum shell. Spindle runs in an oversize "Oilite" bearing and is equipped with a ball thrust bearing. Specifications: capacity in steel, ¼ in.; no-load speed, 1,600 r.p.m.; full-load speed, 875 r.p.m.; weight, 2½ lb.

Dykem Marking Colors

Metal marking colors, which may be applied by rubber stamping or by stenciling, are offered by The Dykem Co., 2301 North Eleventh St., St. Louis, Mo., for marking part numbers, alloy numbers, name, date or other identification on metal surfaces of all types. These colors are said to give a clear and distinct impression which is legible even in small type. They contain no oil or moisture and dry in approximately 10 sec. with a thin, tough coating which resists oil, moisture, cold and frequent handling. The manufacturer claims that a thin film of oil does not prevent these marking colors from adhering firmly to the metal surface, as the color penetrates the oil film immediately and dries quickly. They are made in red, Type KR, and purple, Type KF, colors.

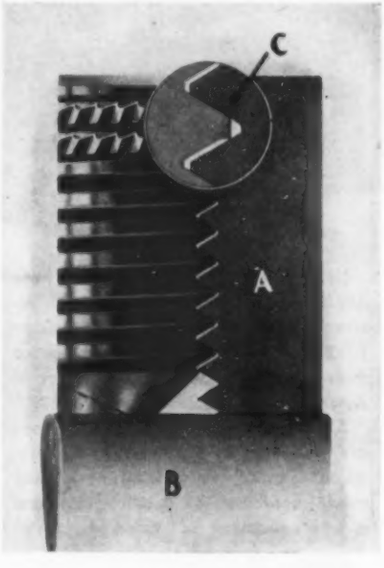
"SAE-Namel" Chart

Illustrating in detail the color code for marking steel bars recently promulgated by the U. S. Department of Commerce, the "SAE-Namel chart" is announced by Mill Service, P. O. Box 763, Springfield, Ohio. This chart measures 22 x 36 in. and lists by S.A.E. Steel numbers, with corresponding code colors and combinations, all of the 89 S.A.E. steels included in the Color Code as officially promulgated. It is designed for convenient reference in purchasing, identifying, marking, warehousing and shipping S.A.E. Steels.

Unbrako Self - Locking Hollow Setscrews

Knurling the two top threads of the "Unbrako" setscrew, offered by Standard Pressed Steel Co., Jenkintown, Pa., is claimed to make these socket setscrews self-locking. This knurling raises sharp prongs all around the edge of the thread which dig into the threads of the tapped hole while the screw is being tightened. The accompanying illustration shows a cutaway view of one of these setscrews in place in a collar.

When the locking threads are engaged with the threads of the collar



and the cup point of the setscrew is forced into the shaft, *B*, the threads are backed up against the side of the threads of the hole. Pressure which forces the setscrew against the shaft also causes the prongs to dig into the threads, as indicated at *C*, in the collar *A*.

Eye Safety for Small Plants

In my city, as in other similar industrial communities, the largest number of eye injuries occur in the metal working trades as carried on in machine shops, shipbuilding plants, car and bus repair shops, railroad and building steel construction work, foundries, garages, etc. Most of these injuries are caused by flying particles of steel, brass, emery and the like, and are trivial in nature in that they usually recover quickly without loss of time from work and without impairment of vision. However, if not promptly and expertly treated they may, and often do, cause serious trouble. About 4 per cent of these injuries cannot be so lightly dismissed. They are of such severity that more or less loss of vision results, and from a compensation standpoint are the most expensive of all non-fatal injuries. The most common serious injury of the eye is the perforation of its coats by a piece of metal or other substance with lodgment of the latter in the interior of the eye. Fortunately about 90 per cent of these foreign bodies are magnetizable steel and can be recovered with the aid of an electro-magnet. The result as to vision depends on the nature and extent of the immediate damage, or whether infection occurs, and on the management of the case.

Recently in going over the records of 100 cases of perforating injuries occurring in my practice, of which nearly all were intra-ocular foreign bodies, it was found that in 62 per cent the accident was caused by using hand tools, a frequent instance being striking a chisel, bolt, fender or other steel object with a hammer. Twenty per cent were caused by particles of steel from lathes, punch presses, high speed saws and similar equipment. Less common injuries were perforations by wire, springs, tools, nails, glass, etc. In 38 per cent of these cases the final result was blindness or very great impairment of vision.

Protection Neglected

An interesting fact shown by these records is that a very large percentage of injuries of this kind occur in small shops and garages, in many of which protection against eye hazards is almost entirely neglected until a serious injury occurs.

Now, as to saving eyesight in a small industrial plant in which there is no safety engineer, physician or nurse, the same principles and practices should be observed as in a plant large enough to maintain this entire retinue. In a large industrial organization a good safety engineer is worth many times his salary. With proper backing by the management he can reduce eye injuries almost to the vanishing point. In small plants accident prevention work is commonly assigned to a foreman or an employment manager. In many cases the latter has very little intelligent interest in safety or is lacking in authority.

I recall a recent visit to a manufacturing plant. The safety man was also the employment manager. He took me over the plant. There was a very large machine shop, and we walked down the aisle with machines on either side doing mostly heavy work. We paused for a moment at one machine, and while we were standing there we were both struck by flying particles of steel. Now this man wore no goggles and had given me none, and I thought that he missed a splendid opportunity to set an example to the men working there.

So much has been written about goggles, but I feel that it is the most important item in my subject. We

Almost an Avalanche
of letters came with its announcement!
THE Atlas SHAPER
No one thing this company has ever developed has received such a tremendous ovation as this new precision 7" Bench Shaper. Letters asking for more information read like a roster of American big business.
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have no way of knowing how many accidents are prevented by shields, guards, screens and other safety devices, including goggles. But I do know that a very large number—probably 90 per cent—of the eye injuries which I see would have been prevented (with a material reduction in my income) had suitable goggles been worn. How do I know this? Because on questioning the injured workman I am told, in the large majority of cases, that the goggles, if any, were on the forehead, in a pocket or hanging on a nail, and the usual stock reasons for not wearing them are given. A certain percentage of accidents are, of course, unforeseeable and cannot be prevented.

Eyes Easily Guarded

The eye is so well protected by its anatomical surroundings that it is not difficult to complete its protection by artificial means. The chief difficulty about goggles seems to be in inducing workmen to wear them. This can be largely overcome by supplying individual, properly fitted goggles of a type suitable for the work, and then making and enforcing *reasonable* rules for their use.

Defective tools are a hazard which I believe is particularly common in small plants where the routine inspection and servicing of tools is often neglected. I have now under my care a young man whose right eye was recently perforated by a piece of steel, causing a cataract. He was striking a mushroomed steel bar with a hammer. Industrial engineers and inspectors for insurance companies regard this hazard as one of the most important causes of serious eye injuries. Apparently it could be eliminated.

It has been shown by many observers that defective vision not only lowers production efficiency, but is a not infrequent cause of accidents. An accident may result directly from poor sight or indirectly from fatigue and the engendered carelessness caused by eye strain. What can be done about this in a small industrial plant? Assuming that the best procedure, which is a complete eye examination by an ophthalmologist (eye physician) is, or is thought to be unfeasible, the vision of all employees should be tested and recorded both at the time of employment and periodically thereafter. This can be done easily and quickly. Any intelligent person can be taught in half an hour the technique of testing and recording the visual acuity. While it is true that in case of litigation these unauthoritative tests may not be accepted in the compensation courts, this is much better than doing nothing, and it will disclose the fact that between 20 and 30 per cent of those examined have visual defects which need expert attention. In most communities can be found an ophthalmologist who will cooperate to the extent of charging minimum fees for making complete eye examinations for a group of this kind. Arrangements can also be made with a dispensing optician to supply glasses at a reduced price. Such a plan, modified possibly to meet varying conditions, is well worth the consideration of any employer. Besides reducing the liability to accidents, a record of the visual acuity thus obtained is sometimes of great value in determining the loss of vision resulting from a subsequent eye injury. Lacking a reliable record of the visual acuity it is often necessary, after an injury, to pay the full compensation based on the acuity after recovery, in the case of an eye which was undoubtedly previously defective, but in which no record of the

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defect can be shown. I believe that the cost of the examination and glasses should be paid by the employee. If properly presented, employees welcome an arrangement such as that just suggested.

"Eye Surveys" made by self-styled "eyesight specialists" whose chief interest is in selling as many pairs of glasses as possible, and who are unable to recognize pathological conditions, are of little value and are the basis of some of the exaggerated statements of the very high percentages of industrial workers and others who need glasses. Why do so many otherwise intelligent industrialists permit their employees to be thus exploited?

Faulty illumination is an industrial hazard which is not only a cause of accidents, but an important factor in fatigue and lowered production. Entirely aside from the promotion of safety, its correction is economically profitable. For the proper remedy it is best to seek the advice of an illuminating engineer.

Many industrial eye accidents are the direct result of carelessness on the part of the workman, including neglect to use available safety appliances and disregard of simple precautions. Some of these individuals are of subnormal mentality and are in trouble frequently.

A study made recently of "accident prone" automobile drivers showed that 100 per cent of the accidents are caused by 15 per cent of the drivers. A study of accident prone workmen would probably reveal a similar ratio.

In my office are records of several men from a large heavy machinery plant, each of whom, during the past 15 or 20 years, had had over 25 separate eye accidents. In cases of this kind there must be something wrong with the management as well as with the men. Many employers undoubtedly need further safety education and an arousing of a sense of moral responsibility for preventable accidents.

Insurance companies and most employers have learned by experience that inexpert care of eye injuries is expensive, both in lost time and damaged vision. An insurance official told me recently that he believed one of the most important factors in saving eyesight in industry is the prompt treatment of an injured eye by an ophthalmologist.

The removal of a small foreign body embedded in the cornea may seem like a simple procedure, but unskillful handling causes unnecessary damage to the surrounding tissues, and often sight-destroying infection. Most plant physicians, nurses and first aid men recognize their limitations and adhere to a hands-off policy for injured eyes. Certain types of serious injury may at first seem trivial to an inexperienced observer, or be completely overlooked. In many injured eyes there are old optical defects or pathological changes, the prompt recognition and evaluation of which are often important in making an estimate of the permanent disability resulting from the recent injury. An experienced ophthalmologist will discover and record such defects. If, after a lapse of several months, a compensation claim is made for alleged impairment of vision, it may then be too late to separate the percentage of disability that should be charged to the old condition, from that resulting from the recent injury. In such cases a record made at the time of the accident is often of great value.

Concerning the immediate or first aid care of an eye injury, the best treatment in most cases is leaving it

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alone. For chemical burns, whether acid or alkaline, the eye should be flushed freely with clean water as soon as possible. Foreign bodies which are not embedded may be removed by wiping gently with a clean, moistened cotton swab. If there is a wound, the eye should be covered with a sterile gauze dressing. Further than this, shop treatment may do more harm than good. As a rule it is better to send eye injuries to an ophthalmologist as soon as possible. This may sound like a sales talk for the eye surgeon, but I have seen so many instances of unnecessary loss of vision because of delayed or unskillful treatment of injured eyes, that I cannot refrain from stressing the point.

Abstract of paper by Dr. Elbert S. Sherman, presented at eighth annual convention, Greater New York Safety Council, April, 1937.

Wear Testing of Metal

Despite all the thought and work on the subject of wear, we are still a long way from being able to predict with assurance the relative lives of two competing metals. We especially lack the ability to put a new alloy, on which service experience is lacking, into its correct position in a list of wear-resistant alloys on the basis of some laboratory test.

In the evaluation of corrosion resistance, it is beginning to be realized that there is no such thing as corrosion resistance inherent to a metal, apart from the particular corroding medium which is to meet the metal in service. To build an alloy to resist corrosion, one must first understand the mechanism of corrosion in the particular service for which it is intended. The same statements may apply to the word "wear", which we may define as "undesired gradual change in dimensions in service under frictional pressure."

Wear of a metal by another usually occurs in one of two ways. In one, asperities on the surface of one catch on asperities of the other or penetrate to form mating asperities and then particles of one or both mates are torn off in a fashion analogous to machining. In the other, the mating metals come into molecular contact, adhere under the existing pressure by a sort of welding (galling) and are then torn apart with particles of one adhering to the other. In the extreme this is called seizure and naturally occurs the more readily the higher the pressure and temperature. Separation of the metals by a film of lubricant tends to avoid either type of wear.

Considerable importance is attached to the disposal of the debris resulting from wear. Work hardening of the surface tends to remove asperities and to produce a more nearly mechanically perfect surface. This tends to resist galling, but on the other hand it may cause spalling of the worked surface due to loss in toughness. In any discussion of metal-to-metal wear it is probable that abrasive dust of some sort is also present.

Wear testing then has to determine the resultant of many factors, some of which can be measured, some only named. Among these are, relating to the metal itself: hardness (resistance to penetration); resistance to deformation; toughness; ability to work harden and properties after work hardening, both at ordinary and elevated temperatures; ability to maintain an absorbed film of lubricant; ability

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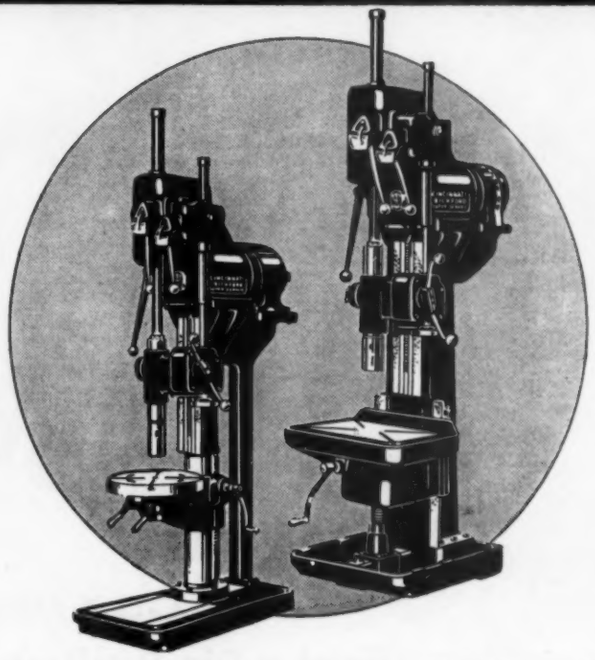

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to take a glaze; ability to discard or embed debris and adventitious dirt; corrodibility; mode of tearing apart on a microscale; ability to be surfaced smoothly before installation; weldability under seizure conditions. From the point of view of clearance and distribution of stress, in bearings, piston rings, and so forth, thermal conductivity, thermal coefficient of expansion and modulus of elasticity may enter.

We know that in any wear problem hardness is of major importance and is usually the outstanding property against which wearing properties may be plotted to show some reasonable gradation, yet even this rule breaks down so often and so completely, as in the case of cast iron, that it must be taken only as the opening chapter of the whole story. Hardness seems to exert its beneficial effect by preventing the penetration of a promontory on a mating part, or of an abrasive particle. If such projections or particles cannot get a toe-hold, they just slide off. If they do get a toe-hold, then toughness is the quality that prevents a chunk being torn out.

Wear resistance is not an inherent property to be measured in absolute units. It does not exist apart from the conditions of service.

The purpose of a wear test is to evaluate wear resistance in use. It is fundamental and axiomatic that since uses vary widely we can have no "universal wear tests" but instead must have many types of wear tests each corresponding truly with specific conditions of use. When studies of wear have to run the gamut between white-metal bearing linings having a hardness at operating temperature of perhaps 5 Brinell up to hard facings and nitriding steel of well over 1,000 Brinell, it is asking a lot of any single method to apply to all such problems.

It would be absurd to test a babbitt bearing metal by a jaw crusher test, but less glaring absurdities are very common.

A useful wear test method must produce wear by the same type of attack as occurs in service. The appearance of the specimen at successive stages of wear ought to be indistinguishable from that of the same material at the same stage in service. Of course, it should give results as rapidly as is consistent with this requirement.

Must Duplicate Results

The test must of course give reasonable concordance on duplicate tests of truly duplicate samples. The rate of wear should be determinable by measurement, by weighing, or by some indirect measurement.

In the case of metal-to-metal wear, attack upon both the wearing and the worn parts should be determinable. It is no answer to a piston ring problem to get a ring that will not itself wear out, but will promptly destroy the cylinder.

The pressure between and the relative speed of the mating parts should be reproducible, measurable and preferably adjustable. The temperature of the working faces should be controllable and measurable. Temperature control is necessary in order that running on a small scale may not increase the rate of heat loss nor continuous operation decrease it. Facilities for the escape of debris should be comparable with service.

A moot point is whether metal-to-metal wear testing without a lubricant correctly represents lubricated service. It is generally thought that with full fluid lubrication there

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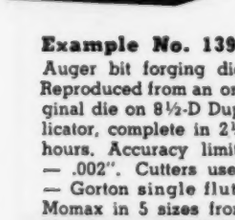

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is a no metal-to-metal contact and no wear, all wear taking place during periods of starved lubrication, especially in starting and stopping, but it is justifiable to test dry. On the other hand when the ability of the metal to retain a film of lubricant under adverse conditions needs study one has to use the lubricant. Duplication of boundary lubrication conditions is difficult. Dilution of the lubricant, as with kerosene, has been advocated.

How much a wear test can be accelerated and how much it can be simplified by omission of "unimportant" variables cannot be stated in advance, but must be demonstrated for the case in hand. In certain specific cases it is alleged that reasonable changes in temperature do not affect the wear of cast iron (but we must be sure that they do not affect the corrosive or other environmental conditions) while on babbitts rather small changes will materially affect wear. Piston rings in steam cylinders can fail by "wire drawing", and "blow by" doubtless affects automotive ring and cylinder wear. One must decide whether such factors come as a final stage in breakdown due to clearance developed by other types of wear and hence whether they may be omitted from the test set-up.

Obviously, if we wish to evaluate wear resistance against non-metallic abrasive wear, some one of the various abrasive tests would be chosen. In this connection one should recall experience of previous testers who have found that different abrasives alter and even reverse the order of excellence of the metals tested and that service wet and service dry were very different.

Comparisons Rare

Comparisons of data obtained on different types of wear test outfits are relatively rare and even when such comparisons are made by two investigators each on his own group of material, there is usually lacking any base lines from which intercomparisons of the two sets of data can be made.

It would appear that in trying to devise a wear test to use as a tool in developing better-wearing material for a given service, one should try to duplicate the conditions of service in as simple an apparatus as possible, leaving in all the known variables of service. Such variables as appear of minor importance can then be omitted, one by one, in tests made to see whether they do or do not alter the results. When the important variables have been spotted, one may then intentionally subdivide the testing procedure to handle them, one by one. For example, we may decide to postpone the question of fit of a bearing on the shaft and study the metallurgy alone. As for example by the Amsler seizure method, apart from the mechanics of bearings. On the other hand, if thermal expansion cuts down clearance and this factor makes a well wearing material actually useless, we might miss that fact entirely in the "simplified" test.

By examination of the worn surfaces produced when some factor of wear is accentuated in order to accelerate testing, one can observe whether the type of wear produced still duplicates that in service. As long as it does, acceleration is probably justifiable.

When the "simplified and accelerated" wear test has been evolved, it should itself be tested by running materials known to give good, mediocre and bad results in service.

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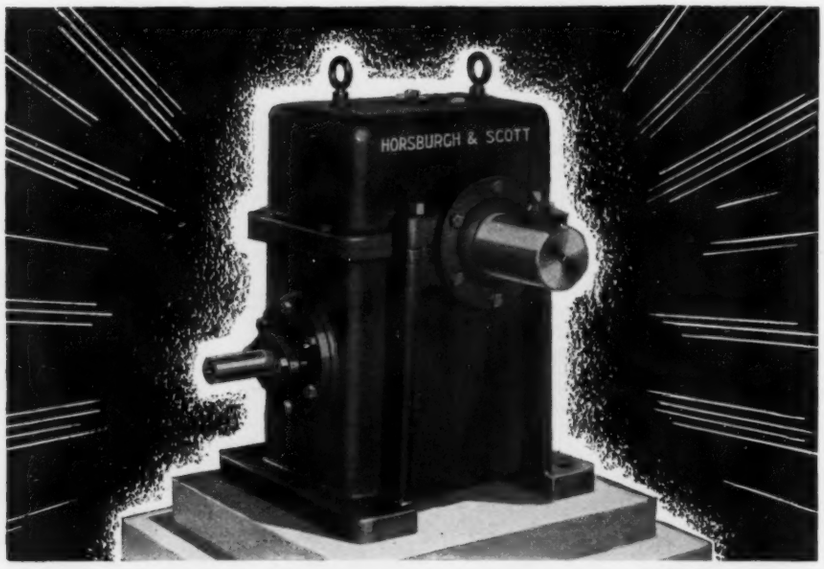
Only if a test unfailingly places these materials in their proper order can we trust it as a guide in the evaluation, prior to service, of new materials. If it does, we can proceed with some assurance; if it does not, we should make a fresh start.

An understanding of the mechanism of wear in a particular service, gained by pure reasoning and metallurgical and mechanical common sense, or gained by trial and error in trying to develop a test, is perhaps the best guide to a satisfactory test. More attention to the fundamental mechanisms of wear and to designing apparatus that reproduces the particular ones that hold in the service in question, will be more fruitful than will the blind adoption of some "standard" wear test.

Wear-resistance is not an inherent property. It cannot be determined or even discussed apart from the specific conditions of use, any more than can machinability or corrosion resistance. Wear is the resultant of the material itself, the mating of the material, and the operating conditions. Omission of any one of the important elements in a parallelogram of forces gives a resultant of wrong length and pointing in the wrong direction.

Abstract of paper presented by H. W. Gillett in the Symposium on Wear of Metals, American Society for Testing Materials, Philadelphia, April, 1937.



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A. C. MOTORS Type AA, explosion-proof a.c. motors, offered by Reliance Electric & Engineering Co., Ivanhoe Road, Cleveland, Ohio, are described in Bulletin No. 124.

AIR CONTROLS A catalog which includes not only revisions and additions to the air control line, but also a new section on hydraulic values for 1,000 to 5,000 lb. working pressure, and engineering data has been issued by C. B. Hunt & Son's Co., Salem, Ohio.

ARC WELDING A 25-page booklet "Arc Welding with the new 40 Volt Simplified Arc Welder," gives details on the control of horsepower in welding, may be secured from Hobart Brothers, Troy, Ohio.

ATLAS EQUIPMENT Lathes, drill presses, arbor presses and other shop tools are listed and described in a 50-page catalog, No. 27, published by Atlas Press Co., Kalamazoo, Mich.

BELTING "Tannate" leather belting and packings are described in a mailing folder offered by J. E. Rhoads and Sons, Wilmington, Del.

BELTS An illustrated, 4-page bulletin on Condor compensated belts is offered by The Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc., Passaic, N. J. Engineering data regarding proper selection and supervision of belts are included.

CASTINGS Properties and applications of a number of Vanadium alloy steels for castings, where high strength is required, are discussed in a 24-page bulletin offered by the Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y. One section of this bulletin is devoted to specifications.

COMPOSITE STEEL Composite tool steels, available in squares and rectangular bars, or in sheets with tool steel covering one entire face to a depth of approximately 35 per cent, are discussed in a bulletin offered by Jessop Steel Co., Washington, Pa.

ELECTRIC FURNACES Conveyor-type electric furnaces for scale-free hardening are described in Bulletin No. GEA-2790, offered by General Electric Co., Schenectady, N. Y.

ELECTRODES Page Steel & Wire Division of American Chain & Cable Co., Inc., Monessen, Pa., has prepared a booklet on stainless steel electrodes which contains considerable information regarding the various grades of stainless steels and the procedure for welding them.

EXPORTS The value and volume of principal exports and imports between the United States and its chief foreign markets are given in "Our World Trade," January–June, 1937, issued by the Foreign Commerce Department, Chamber of Commerce of the United States, Washington, D. C.

FILES Grobet File Corp. of America, 3 Park Place, New York, has announced publication of the 1937 catalog on Grobet Swiss files. More than 5,000 different precision files are listed.

FINISHING A mailing folder offered by The Manhattan Rubber Mfg. Div., Raybestos-Manhattan, Inc., Passaic, N. J., describes the new rubber-bonded finishing wheel.

FLOOR SWEEPS Simplified Practice Recommendation No. R88-37, recently promulgated by the Division of Simplified Practice, National Bureau of Standards, U. S. Department of Commerce, lists standards developed for industrial, household, garage and institutional brushes.

FURNACES Furnaces for heating and heat-treatment of metals are described in a 36-page bulletin being mailed by Surface Combustion Corp., Toledo, Ohio.

FURNACES Type D and DT convected air furnaces for heat-treating dense and coarse loads are described in detail in a catalog section offered by Despatch Oven Co., 622 Ninth St., S.E., Minneapolis, Minn.

FURNACE CONTROLLERS Wheelco Instruments Co., 1929 South Halsted St., Chicago, Ill., announced publication of two bulletins describing instruments for controlling and indicating temperatures. Bulletin No. 602 describes the "Capacitrol" and Bulletin No. 650 describes the new "Proportioning-Indicating" controller.

GAS BURNER Burdett Mfg. Co., 19 North Sheldon St., Chicago, Ill., offers an 8-page bulletin describing the Burdett radiant-heat burner.

GAS BURNERS Ensign-Reynolds, Inc., Div. of American Gas Products Corp., 40 West 40th St., New York, announces publication of a 64-page catalog listing compressors and burner equipment for the improved utilization of gas industry.

GRINDERS AND BUFFERS Marschke heavy-duty grinders and buffers, of various types and capacities, are described in detail in a 22-page catalog offered by Vonnegut Moulder Corp., 1815 Madison Ave., Indianapolis, Ind.

HEAT-RESISTING ALLOYS Nichrome, Chromax and Cimet alloys for heat and corrosion resisting applications are described in a bulletin announced by Driver-Harris Co., Harrison, N. J.

HEAT TREATING The use of "Bellislavite" furnaces for hardening, tempering, annealing and case hardening operations is discussed in a folder published by The Bellis Heat Treating Co., Branford, Conn.

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high-speed steel that is available in the form of annealed billets, bars, rings, forgings and hardened tool bits, is described in a folder offered by Universal-Cyclops Steel Corp., Bridgeville, Pa.

INCLINABLE PRESSES Niagara Machine & Tool Works, 637-697 Northland Ave., Buffalo, N. Y., announces publication of a 38-page Bulletin, No. 58-G, which lists specifications of the complete line of the Niagara Master series "A" and Standard series inclinable presses.

IMPORTS Works Progress Administration has prepared, under the direction of the United States Tariff Commission, Volume III of "Imports into the United States for Consumption—by Countries—1929." This volume includes statistics on machinery and vehicles and metals and manufactures.

INDUSTRIAL STEELS Macalloy steels offered by Vanadium-Alloys No. 1 and No. 2, industrial alloy Steel Co., Latrobe, Pa., are described in a folder recently published. Information is given regarding the general characteristics and physical properties, as well as the heat treatment of these steels.

LATHES "What Makes Main Street?" is a machine tool catalog which is a colorful departure from the general type of catalog and presents the various mechanical features of Le Blond lathes in an interesting manner. It may be secured from The R. K. Le Blond Machine Tool Co., Cincinnati, Ohio.

LIFT TRUCK Bulletin No. P301, announced by The Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia, Pa., describes the 2500-lb. capacity "Blue Streak" hand lift trucks.

METALSPRAYING Bulletin No. 800, published by Metalspray Co., Inc., 113 Llewellyn St., Los Angeles, Calif., describes some of the more recent applications in metalspraying.

MOLYBDENUM STEEL "Van-Lom", an improved molybdenum high-speed steel, offered by Vanadium-Alloys Steel Co., Latrobe, Pa., is discussed in detail in a 12-page booklet, recently announced.

OIL BURNER Bulletin No. 404, announced by Hauck Mfg. Co., 121 Tenth St., Brooklyn, N. Y., discusses the features of the proportioning oil burner which is claimed to automatically proportion and maintain correct and straight line air-oil ratio from minimum to maximum capacity. Specifications are listed for the various sizes available.

OILLESS BEARINGS "Brazeless bearings are discussed in a 6-page bulletin offered by Paramount Oilless Bearing Co., Inc., 100 Hope Ave., Worcester, Mass.

POWER TRANSMISSION Stock gears, speed reducers, chain drives, bearings, joints and couplings are listed in a folder being mailed by Boston Gear Works, Inc., North Quincy, Mass.

PRESSES Niagara Machine & Tool Works, Buffalo, N. Y., has issued Bulletin No. 60–C which describes the latest improvements and developments in the complete line of Niagara Horn presses.

PUNCH PRESSES Turret punch presses of nine types are described in an illustrated bulletin offered by Wiedemann Machine Co., 1815-31 Sedgley Ave., Philadelphia, Pa.

RAMMING CEMENTS Type SM-60 and Type SM-70 "Shamva Mul-

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lite" ramming cements for use in industrial furnaces are described in a bulletin announced by the Mullite Refractories Co., Shelton, Conn.

REFRACTORY "Shamva Mullite" refractory material for industrial furnaces is described in detail in a 16-page bulletin offered by The Mullite Refractories Co., Shelton, Conn. This material is claimed to be chemically neutral and to have a high softening point.

SCREWS AND BOLTS Phillips recessed-head, self-centering screws and bolts are listed and described in a folder being mailed by American Screw Co., Providence, R. I.

SCREW MACHINE ATTACHMENTS A catalog which describes and illustrates cams and tools for automatic screw machines has been prepared by Banner Mfg. Co., 1873 Clybourn Ave., Chicago, Ill.

SCREW PRODUCTS Multiple-spline-socket safety screw products are listed in a mailing folder published by The Bristol Co., Waterbury, Conn. Ask for Bulletin No. 833.

STEEL Form No. 373, now being mailed by Union Drawn Steel Co., Massillon, Ohio, lists the company's 23 district sales offices.

STIFFNESS TESTERS Several models of improved stiffness testers are described in Bulletin No. 11, offered by Tinius Olsen Testing Machine Co., 500 N. 12th St., Philadelphia.

TIN ALLOYS "Fusible Alloys Containing Tin," by E. J. Daniels, has been made available by International Tin Research and Development Council, 149 Broadway, New York.

TIN BRONZES Mechanical Properties of Some Tin Bronzes, by Dr.-Ing. H. Lepp, is the subject of Technical Publication No. 3, Series D, offered by International Tin Research and Development Council, 149 Broadway, New York, N. Y.

TURRET PUNCH The Type R-7, 54-in. throat, heavy-duty, motor-driven turret punch, manufactured by Wiedemann Machine Co., 1815-31 Sedgley Ave., Philadelphia, Pa., is described in detail in a new 4-page circular.

VARIABLE SPEED UNITS A 4-page folder describing the Reeves Motordrive has been made available by the Reeves Pulley Co., Columbus, Ind.

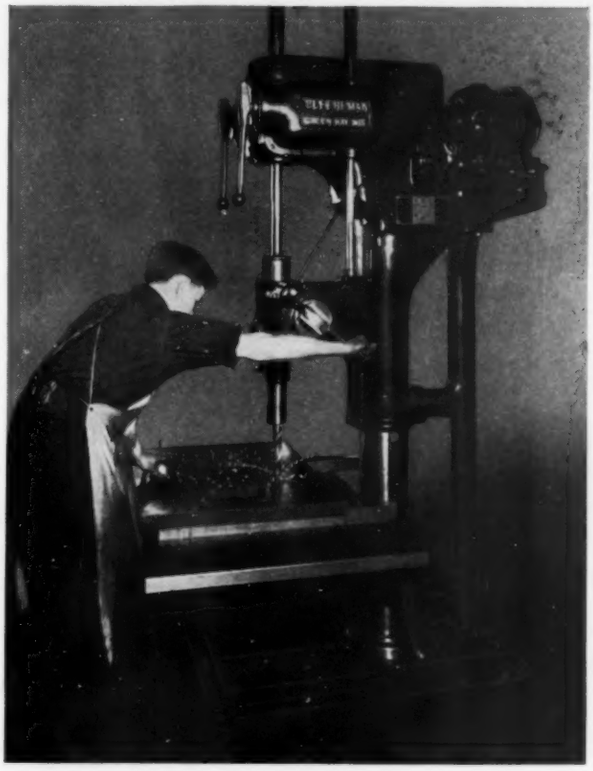
VIBRATION American flexible vibration eliminators, for air conditioning and refrigeration installations, consist of a short section of seamless flexible bronze tubing with standard slip fittings welded on both ends. These units are described in Bulletin No. VE-2, offered by American Metal Hose Branch, American Brass Co., Waterbury, Conn.

WAGES AND HOURS Machinery and Allied Products Institute, 221 North La Salle Street, Chicago, Ill., has issued the sixth pamphlet in the standard of living series, entitled "Machines and Working Hours."

WET PATCH CEMENT SM-100 Wet Patch Cement, described in a bulletin offered by the Mullite Refractories Co., Shelton, Conn., is a plastic material claimed to be suitable for repairing refractory linings of industrial furnaces.

WIRE CUTTING Bulletin No. 536, offered by The Lewis Machine Co., 3441 E. 76th St., Cleveland, Ohio, discusses the features of the "Travel-Cut" flying shear for automatically straightening and cutting wire in lengths up to 18 in.

. . CLEEREMAN
DRILLING MACHINES



SLIDING HEAD— ROUND OR SQUARE COLUMN

● At work in the plant of the Brust Tool Manufacturing Company, Chicago, well known makers of precision tools and fixtures, this round column 25" Cleereman Drill is giving highly satisfactory performance . . . It is fully geared . . . has anti-friction bearings . . . is automatically oiled . . . has single lever control of feeds and speeds. . . . Furnished with reversing motor—no friction clutches . . . can be furnished with square column and in special arrangements . . . Tell us your drilling requirements—the Cleereman line of drilling machinery is complete . . . Write for descriptive bulletin.

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Foremen as Sub-Managers

W. R. NEEDHAM
Stychfield, Stafford, England

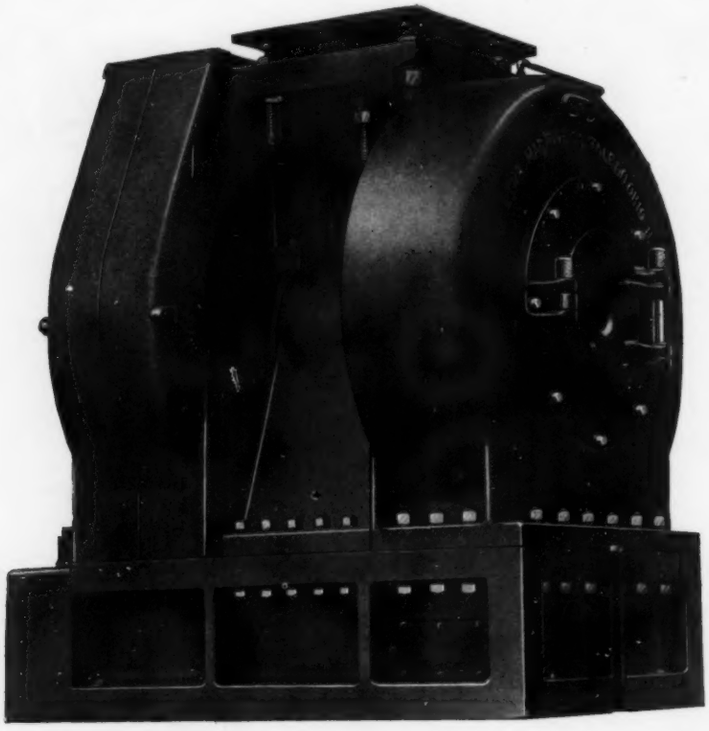
Many general managers in manufacturing plants fail to realize how much depends on how department heads interpret and carry out their sub-managerial functions in their respective spheres of activity. The work and influence of these lieutenants is most significant; they can aid or hinder the company to a marked degree.

While certain companies reflect principally the lead given them by one dominating personality; it still remains true that a great measure of the success obtained is due to the loyalty and skill shown by assistant managers and foremen. Success is the response to a concerted effort; both the leading and the following must be direct and thorough.

The foreman is the indispensable link between management and the workers. He must interpret clearly and correctly management's policy in so far as it affects the internal affairs of the plant. How well the workmen follow instructions is decided by their reaction to the leadership of their respective foremen.

It pays management, on all counts, to solicit the best the foremen have to give. These liaison officers must give the right kind of instructions, set the right pace in the best direction, and win the cooperation of their respective teams. First, however, management must realize that it must have its ideas clearly defined.

Mutual respect and reasonable candor are essential before management can hope to get the best out of even the best foreman. Obedience obtained by taking such an officer into a large measure of confidence is understanding, informed, keen and fruitful. The active goodwill of the foreman can be enlisted if he be told something of the why and wherefore, as well as the what, of management's plans.



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New Etna
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These recently introduced models are new in performance, as well as design . . . but older Etna standards of quality material, expert workmanship and rugged construction have been retained.

Adapted for hot or cold work, the complete circulating system is an integral part of the machine. Built in 2, 3 and 4 inch capacities—with die length of 4 to 18 inches. Smaller models down to ⅜ inch capacity . . . and larger ones built to order up to 10 inch diameter. All are equipped with Timken bearings.

Model 312, with a capacity of 3 inches and die length of 12 inches, is shown above. WRITE TODAY. Let us show you how the *New Etna Swaging Machines* can solve your problems.

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Smoother Freight Cars

Freight cars that reduce shock 300 per cent have been tried out successfully on the London Midland and Scottish railway, say reports to the Commerce Department. One hundred cars of the type have been ordered. Rubber buffers are used between the body and the chassis of the car.

Selective Assembly or Interchangeability

Those who talk glibly about precision work with absolute interchangeability should visit some of the plants that make high grade anti-friction bearings. Parts for these bearings are made with the greatest precision obtainable from modern machinery. Inspection of these parts requires approximately one-third of the employees in some of the best known plants. This inspection is in reality operation as in checking dimensions. With the parts graded by very small differences in dimensions, the assembly becomes an easy matter, and the customer is assured of a finished product that will be found both accurate and satisfactory. It also emphasizes the advisability, if not the necessity, of selective assembly rather than an attempt at absolute interchangeability, where tolerances are measured in "tenths."